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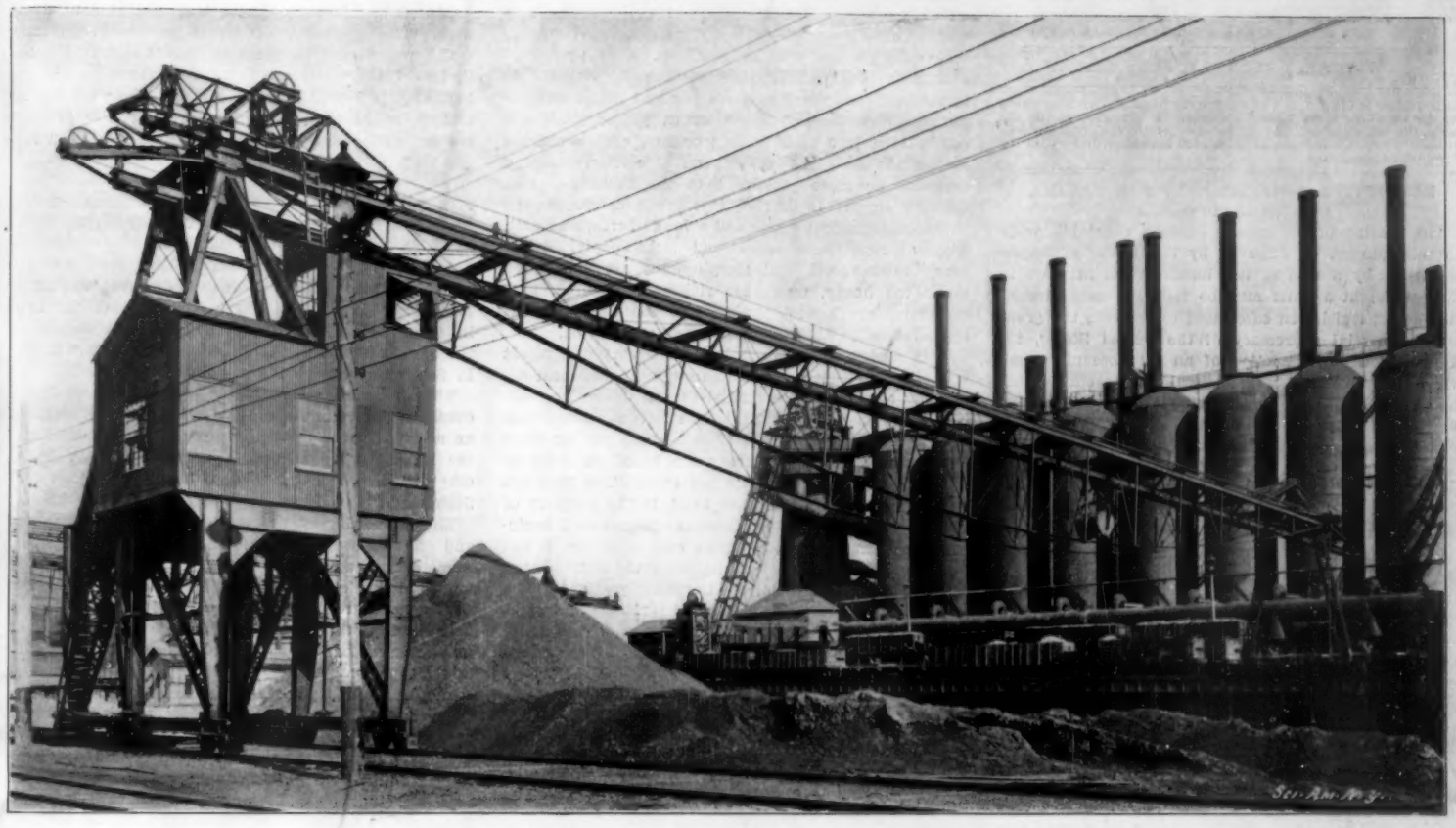
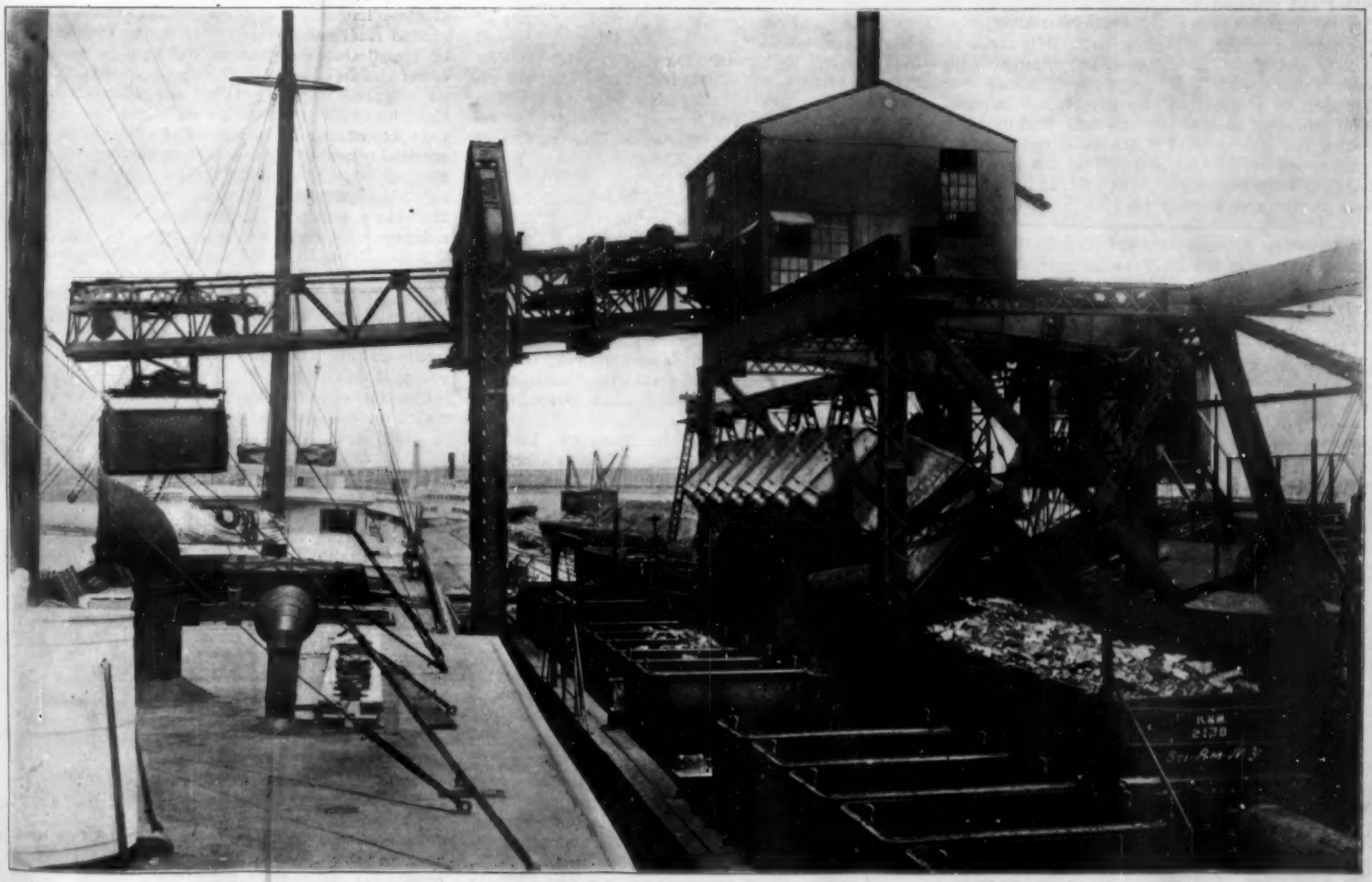


Tramway Plant for Conveying Ore, Coal, etc., from the Cars to the Storage Piles and Furnaces.



Massive Machine for Dumping Carload of Material at a Time into Buckets and Discharging Same into Hold of Vessel.

MECHANICAL HANDLING AND TRANSPORTING OF MATERIAL.—[See page 8.]

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NEW YORK, SATURDAY, JULY 5, 1902.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates

PROSPECTIVE COMPLETION OF THE PANAMA INTEROCEANIC CANAL.

The passing of the Senate Panama canal bill without amendment on June 26 by the House of Representatives by a vote of two hundred and fifty-two in favor to eight against may be regarded as a memorable act of legislation calculated to promote the growing commercial supremacy of the United States, for it insures the construction of an inter-oceanic canal, which when finished will be used by the entire commercial world. Quickly following the passage of the bill the President completed the law by affixing his signature on June 28, thus bringing to a successful close the interocean canal discussions and controversies so long pending.

The first step to be taken by the President under the act is the negotiation of a treaty with the Colombian government, which it is thought will be completed for ratification by the Senate next December.

At the same time, it is probable all the stipulated concessions and rights of the New Panama Company will be secured.

Then the President will appoint the Isthmian Commission, subject to ratification by the Senate. When so approved, the Commission will make preparations to begin the work, let us hope within the year. It is calculated eight or nine years will be required to complete the canal.

When the work actually begins, it is evident that there will be excellent opportunities for the display of American skill and American enterprise; and no one can doubt that American devices and machinery, guided and managed by American engineers, will be able to surmount many difficulties that may arise. The work is certain to arouse national interest, especially as the plan of a popular subscription to the bonds is provided.

It shall be our aim to keep our readers informed about this great work as it progresses. Full data concerning the present state of the canal and Isthmian commission's report will be found in the SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 1359, 1361, and the SCIENTIFIC AMERICAN of January 18, 1902.

A PRUSSIAN OPINION OF AMERICAN RAILWAYS.

Some two years ago the Prussian government sent to the United States a committee of official experts to study the methods of railway construction and management in this country, for the purpose of determining whether or not it would be advisable to introduce American ideas in Germany. The commission spent several months in the United States, and made elaborate studies of everything pertaining to American railway building. It was hoped that these studies would eventually be published in an official report; but the government has decided not to give to the public the results of the commission's work. Baron von Thielen, Chief of the Prussian Ministry of Railways, has, however, granted interviews, in which some of the conclusions drawn by the commission have been divulged.

It is admitted that much was learned in the United States. Especially interesting and valuable was the American plan of locomotive construction in standard types with interchangeable parts. German railways will probably soon adopt the American idea, at least to a certain extent.

But so far as freight and passenger cars are concerned, it was considered doubtful whether American practice was suitable for Germany. In the United States it is found extremely economical to haul enormous masses of freight over long distances in forty, fifty or sixty-ton freight cars. In Germany, where the amount of freight handled is much smaller, and the distance to which it is transported far shorter, the need for individualizing shipments is so general that the introduction of large American freight cars will probably be attended with serious difficulty. The old ten-ton German freight car, in the opinion of Baron von Thielen, might well give way to a car of thirty tons capacity. But enlargement beyond that limit would necessitate changes in track, switches, platforms and especially in the loading and unloading arrangements of mines, furnaces and large manufacturing plants. It is, therefore, to be inferred that the Prussian freight car of the future will have a maximum capacity of thirty tons and will be mounted on bogie trucks of the American type.

In the matter of passenger cars, the Prussian State Railways have adopted a definite model for long-distance service. A vestibule car is used, varying in length from 58 to 60 feet and running on two four-wheeled trucks. Each car is divided into compartments, with a corridor aisle running along one side. The introduction of Pullman cars has not been a success. Three Pullmans of the standard American pattern were given a trial in Germany. That they were admirably built, that they ran with remarkable smoothness and freedom from jar and noise, was admitted. Nevertheless, the German public prefers a car divided into small compartments, each accommodating six or eight passengers. American sleeping cars are no more popular than the Pullmans. The German sleeper is divided into small compartments, each containing an upper and a lower berth, and each having a separate washbowl and water supply. American drawing-room and sleeping-cars are considered much too heavy, much too richly upholstered, and, therefore, much too costly. But the cheapness of special fare on these cars is frankly admitted.

This, in brief, is the opinion of the commission. It was admitted that the American system was most admirably adapted to the United States, where long distances are to be traversed, where railways are owned by corporations who must keep a sharp eye on their rivals, where social relations are based on equality and restrictions of caste do not exist. The Prussian railway system, on the other hand, is the property of the state. After slow development from small beginnings, and after much planning and scheming, it has finally been brought to pay not only the entire interest on the Prussian debt, but to earn a yearly surplus. But it cannot be doubted that the rates for freight and first-class passenger fares are high, so high, indeed, that the farmers and inland industries are in a measure crippled.

THE NEED OF A LOCOMOTIVE SMOKE CONSUMER.

The begrimed buildings of New York city, and the vast black veil of smoke which envelops the metropolis, speak eloquently of the hardships to which the inhabitants of the Eastern States are subjected by the use of soft coal, rendered necessary by the strike of anthracite miners. So limited is the supply of hard coal, and so high its price, that the Manhattan Elevated Railroad Company, as well as the owners of large office buildings, have persisted in burning soft coal, despite the fact that the Sanitary Code of New York expressly prohibits the discharge into the atmosphere of smoke and injurious vapors. The firm stand taken by the Health Board of the city has resulted in the adoption of consumers by owners of office buildings. The evil has thereby been partly mitigated; but the Elevated Railroad Company day after day continued to discharge into the air its volumes of smoke, which, as the newspapers expressed it, "hung like a pall over the city," until the Board of Health succeeded in prohibiting the use of soft coal.

If the office buildings have found the use of smoke consumers practicable, the question naturally arises, Why is it the locomotives of the railway companies cannot be equipped with similar apparatus to prevent the contamination of the city's atmosphere? The Elevated Railway officials stated that they knew of no practical smoke consumer which could be applied to their locomotives.

The problem of burning bituminous coal in locomotives without the production of black smoke, has confronted railway engineers for some time. It has been clearly enough proved that the smoke can be almost entirely done away with by using the proper precautions in firing. Coal thrown into the firebox a half shovelful at a time, is rapidly consumed by the intense heat of the fire, and with it the smoke. But if the fuel be tossed into the firebox in large quantities, which is the practice of the indolent fireman, a thick layer is formed over the fire, which is not consumed for some minutes and which loses a goodly amount of fuel in the form of a thick smoke. How large a percentage of fuel is thus lost may be inferred from the analysis of a sample of snow, gathered ten days after it had fallen in the outskirts of Manchester, England. After melting the snow a residue was obtained which was equivalent to over 10 pounds to the acre, and which consisted of 48.6 per cent carbon, 8.9 per cent grease and 44.5 per cent ash. Another sample, taken from the heart of the city, contained nearly three times this amount of residue, or in other words, about a ton of soot per square mile a day. Waste of any kind nowadays is unpardonable; and with the world's supply of coal visibly nearing exhaustion, wanton waste of fuel is more than unpardonable.

Mechanical stokers combined with special types of firebox have been found completely to solve the smoke problem for stationary plants. Some similar arrangement has long been needed for locomotives. What is wanted is a mechanical stoker, simple in construction and practical in operation, which can be applied to a locomotive without necessitating any great alterations. Such a stoker was invented a short time ago by a former engineer of the Chesapeake & Ohio Railway. In this appliance the coal is scattered in a thin layer over the fire, thereby avoiding the constant opening of the firebox, and the consequent admission of cold air. Not only is it claimed that fuel is saved, but that nine-tenths of the thick, black smoke usually produced by hand-firing with soft coal is done away with. The provision of a simple smoke-consumer which will permit the burning of soft coal within the limits of large cities without annoyance to the inhabitants is a problem that certainly deserves the attention of American inventors. Up to the present, too little time and thought have apparently been lavished upon the subject.

THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—GREAT BARRINGTON MEETING.

BY WILLIAM H. HALE, PH.D.

A notable gathering of electrical engineers was the meeting of the American Institute at the Berkshire Inn, Great Barrington, Mass., June 18 to 21, both in its social and its scientific features. Owing to the absence in Europe of President Scott, Mr. Charles P. Steinmetz, the retiring president, presided.

The first day was occupied with papers and discussions upon alternating current work, and included an account of the new generating plants of the Niagara Falls Power Company, by Mr. Harold W. Buck; other papers were by Messrs. Baum, Le Blanc and Steinmetz.

The second day of the session was devoted to papers and discussion upon electric railway work. Mr. A. H. Armstrong read a study of the heating of railway motors, in which he discussed the problem of keeping the temperature of the motive power within reasonable limits; also the operation of single cars at maximum speeds of 60 to 70 miles per hour. He finds it preferable to use the largest gear ratio and highest rate of acceleration possible for the accomplishment of the service contemplated, provided the maximum speeds are low, but that practically any rate of acceleration can be used where speeds approach a maximum of 60 miles per hour. The expense of running single cars is much greater per ton than running the trains, being more than double that required for five-car trains.

Mr. C. O. Mailloux presented notes on the plotting of speed-time curves, giving a practical and ingenious method readily applicable and obviating the necessity of complicated mathematical calculations in many cases; also an experiment with single-phase alternators on polyphase circuits, incidentally illustrating the elasticity of the polyphase system, which was recently tried successfully at Phœnix, Ariz., and which is a practical demonstration of the possibility of using single-phase alternators as the source of energy for supplying polyphase currents, both two-phase and three-phase, and also for supplying direct current to a transmission and distribution system.

Messrs. Bion J. Arnold and W. B. Potter presented comparative acceleration tests with steam locomotive and electric motor cars, showing that the latter can accelerate much more rapidly than the former, and can maintain a higher average speed with lesser maximum speeds than the former, thus consuming less energy for the run.

The efficiency of an electrical system as an average under variable load may be assumed as follows:

Engine	90 per cent	efficiency.
Alternator	92 per cent	"
High potential transmission	98 per cent	"
Transformers	97 per cent	"
Converters	92 per cent	"
Third rail	95 per cent	"

Motors, including control, 75 per cent efficiency, 51.33 per cent.

These tests were made on the main tracks of the N. Y. C. & H. R. R. R., west of Schenectady, and were for the purpose of determining the availability of electric traction in the new Park Avenue railroad tunnel in New York.

Mr. Arnold followed with an elaborate report of the method of ascertaining by means of a dynamometer car the power required to operate the trains of the N. Y. C. & H. R. R. R. between Mott Haven Junction and Grand Central Station, and the relative cost by steam and electricity.

This division consists of 5.3 miles of four-track road, of which 0.68 mile from the station is in an open cut, 2.04 through a tunnel under the street and 2.58 miles on an elevated stone and steel structure to Mott Haven Junction.

The most practical method of ascertaining the

power required to propel the trains was to measure by means of a dynamometer car the draw-bar pull of various trains. The braking effort per ton is not so high on certain types of locomotives as it is on coaches, due to the fact that not all wheels on the locomotive are always braked, and those that are braked cannot be set to the skidding point with a fully loaded tender, for if they were they would then skid with a slightly loaded tender.

Mr. Arnold recommends instead of the ten or twelve different types of locomotives now used electric motors weighing about 65 tons each, which for heavy work can be coupled. He stated that if given the opportunity he would make the necessary changes and install the new system within six months. The third rail is recommended for the tunnel, and the overhead system for the yards.

Of twelve different plans considered, the first, theoretically the most economical, provides for a direct-current power station at center of line and contiguous to tracks, 600-volt working conductors, no batteries, but this is impracticable because it would locate the power house in the residential portion of Park Avenue.

The twelfth plan therefore was the one recommended, namely, combined alternate-current and direct-current power station at Harlem River near outer end of line, one sub-station near other end. Batteries in power station and sub-station. Alternate-current transmission, 11,000 volts, direct-current conductors 600 volts.

While Mr. Arnold believes the alternating-current railway motor to be the most efficient, all things considered, for long-distance railway work, it has not yet demonstrated its ability to start under load as efficiently nor to accelerate a train as rapidly as the direct-current motor. The latter have also become standardized, and are the only type readily procurable from manufacturers in the United States; hence they are recommended for this terminal traction work.

Although the question of economy is relatively unimportant, safety and comfort being first to be considered, yet there is a slight economy also in the substitution of electricity for steam, as shown by the following table:

	Steam.	Electricity.
Operating expenses per mile exclusive of fixed charges, but including water, labor, cost of cleaning and repairing tunnel, and all other expenses of locomotive operation	23.05	15.80
Fixed charges per locomotive mile, assuming that it now requires 40 locomotives to perform the present service and that 33 electric locomotives could perform the same service	1.13	7.83
	24.18	23.63

Perhaps the most important incident of the entire meeting was the announcement by Mr. Arnold, in closing the discussion of this paper, that he had invented a new system of electric traction whereby he utilizes waste forces and regulates and stores up force without depending on regulation from the power house. This is effected by applying surplus force to the compression of air, which as necessity requires, is released and adds the force needed to meet extra demands. Thus the motor can climb a grade as rapidly as it can descend; it can climb steep grades; by using its reserve it can traverse gaps in the line over private right of way, or onto spurs, sidings, etc.; so that ultimately power need only be transmitted along the main line, and also a great saving can be effected in buildings for conversion, etc. President Steinmetz commended the invention as one of great importance.

The third day was occupied with papers and discussions on various topics, lightning arresters, photometers, a curve-tracing instrument, loss of energy in transmitting power, electrostatic wattmeter, predetermination of alternator characteristics, by Messrs. Thomas, Matthews, Owens, Skinner, Walker and Herdt respectively.

The feature of the day, however, was the report of the committee on standardization by Dr. A. E. Kennelly and the ensuing discussion.

Much satisfaction was expressed that the government has now established a bureau of standards which is conducted in harmony with electricians. The report was adopted except that two sections were referred back to the committee with power of revision and of final settlement. One important matter which the Institute thus leads off in establishing without awaiting governmental or other sanction, but confident that its action will meet general approval and command universal acquiescence, is the fixing of a standard for candle power. After full discussion the recommendation of the committee was approved; and the standard, as far as the Institute can fix it, makes the Hefner = 0.88 British candle, as the ratio of horizontal intensities. The Hefner-Alteneck amyl-acetate lamp is—says the report—in spite of its unsuitable color, the standard luminous source generally used in accurate photometric measurements.

Prof. Owens presented the invitation of McGill University to hold the next meeting of the Institute at Montreal. A similar invitation has already been sent to the British Institution of Electricians. The Institute adopted a resolution inviting the British Institution to hold a joint meeting; but owing to the belief that probably 1904 would be preferred on account of the St. Louis Exposition, date and place were left undetermined.

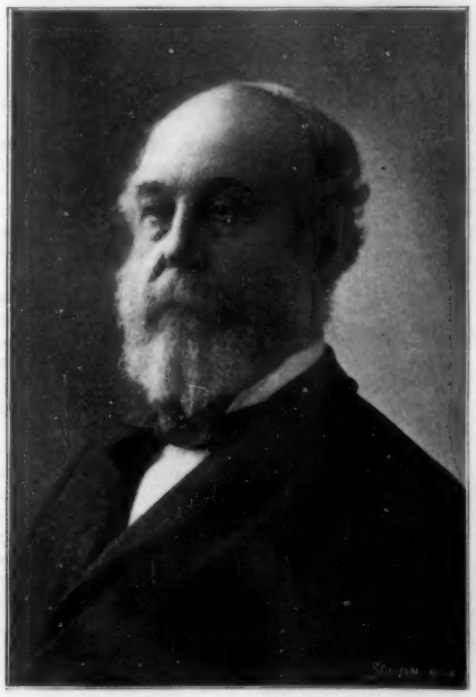
The exercises of the last day of the session consisted of papers and discussion on the education of an electrical engineer, by Messrs. Steinmetz, Sheldon, Owens, Esty, Buck and Raymond.

ASAPH HALL.

BY MARCUS BENJAMIN, PH.D.

The American Association for the Advancement of Science has two characteristic features. It meets in a new place and inaugurates a new president each year. In 1901 it met under the shadow of the Rocky Mountains in Denver, and this year it meets in the great industrial center of Pittsburg. The eminent naturalist, Prof. Charles S. Minot, who presided so gracefully in the West, yields the chair to an equally distinguished representative of the physical sciences.

Asaph Hall was born in Goshen, Conn., on October 15, 1829, and received a common school education in his native town. For a time he worked on a farm, but when he was sixteen years old he took up carpentry and followed that trade for many years. Meanwhile a thirst for knowledge that would not down came to him, and in his twenty-fifth year he began the study of geometry and algebra in the Norfolk Academy. Later he went to Wisconsin, and still later to Ohio, in both of which States he taught school, from the earnings of which he was able for a single term to study at the University of Michigan.



ASAPH HALL.

In 1857 he entered the observatory at Harvard as a student, but his abilities were so manifest that he was almost immediately assigned to the working staff with the rank of assistant, remaining in that capacity until August, 1862, when he was appointed an aid in the United States Naval Observatory in Washington. A year later he was made Professor of Mathematics in the United States Navy, and remained as such until 1891, when he was retired with the relative rank of captain. It is with the United States Naval Observatory that his name will be associated always for the brilliant discoveries that were made by him and which have gained for him such eminence among the astronomers of the world.

In addition to the usual routine work required at the Naval Observatory, he was from time to time assigned to important astronomical expeditions. These have included the parties sent to observe the solar eclipse from Bering Sea, and from Sicily, Italy, in 1870. He had charge of the American party sent to Vladivostok, Siberia, to observe the transit of Venus in 1874, and was chief astronomer of the expedition stationed at San Antonio, Texas, at the later transit in 1882.

His most famous contribution to astronomy was the discovery of the moons of Mars. Exact calculations were made of their orbits, and Prof. Hall gave to them the names of Deimos and Phobos (Wrath and Fear), from the passage in Homer's "Iliad" where these two divinities are mentioned as the attendants of the god of war.

His subsequent work has included important observations of double stars, an account of which he published in 1880. He also devoted much attention to Oberon and Titania, the outer satellites of Uranus, publishing in 1886 the results of observations made by him during 1875-76 and 1881-84 with the large telescope of the Naval Observatory. In the same year he gave to the world the results of similar observations on the satellite of Neptune and on that of Saturn.

On his retirement from the service of his government, he settled in Cambridge, Mass., and renewed the experiences of his early manhood with valuable work in the Harvard Observatory. Recently he returned to the home of his boyhood in South Norwalk, Conn.

In 1878 the Lalande prize of the French Academy of Sciences was awarded him for his discovery of the moons of Mars, and in 1879 he received the gold medal of the Royal Astronomical Society, "for his discovery and observations of the satellites of Mars, and for his determination of their orbits," as "the highest mark of esteem in the gift" of that Society, while in 1895 he received the Arago medal of the French Academy of Sciences.

In further recognition of his contributions to his chosen science, Hamilton conferred upon him the degree of Ph.D. in 1878, and that of LL.D. was given him by Yale in 1879, and by Harvard in 1886.

Prof. Hall has been elected to numerous scientific societies both in this country and abroad, including the French Academy. In 1875 he was chosen to the National Academy of Sciences, of which in 1883 he became home secretary, and in 1897, on the death of Gen. Francis A. Walker, he was chosen vice-president.

His connection with the American Association has been a long and honorable one. He joined that organization in 1876 and a year later was made a fellow. In 1880 he presided over Section A, delivering a retiring address at the Boston meeting on "The Advances in Astronomy," in which he said that "the great value of astronomy is that it is really a science, and that it has broken the path and led the way through which all branches of science must pass if they ever become scientific."

TIMBER RAILWAY BRIDGES IN AUSTRALIA.

In Australia, when the first railroads were constructed, the bridges were almost entirely built of timber, and even now this type of bridge is often erected in lieu of steel structure, as the native woods —seventeen varieties are available—are specially adapted to the work, owing to their great strength. The life of such bridges varies from thirty-five to fifty-five years, according to their location and other circumstances. In Queensland a large timber bridge has recently been completed. It is 320 feet long and 18 feet 6 inches wide. It spans a creek 10 feet deep at high-water mark, and which also has 20 feet of black mud below the bed. In flood times the water rises 25 feet above the level of ordinary high-water mark. The supporting piles are of iron bark timber well creosoted. The cost of driving the piles complete, including materials, labor, plant, etc., was $1.80 per lineal foot. The decking and its members are of spotted gum, and the cost was $19.80 per square, including all material and labor. The total weight of all the timber in the bridge as fixed is about 200 tons, while the weight of the iron work fixed is 4½ tons. The total cost of the structure, including a small portion of the approach roadway, was $9,500. The principal and most durable kinds of timber suitable for bridges are ironbark, spotted gum, blue gum, bloodwood, blackbutt, box, mahogany, karri and swamp mahogany. Ironbark, mahogany, blue gum, bloodwood, swamp mahogany, turpentine or peppermint, tea, she-pine and cypress pine are very durable when constantly immersed in water or wet ground, and are, therefore, well adapted for piles, etc., for the foundations.

The various methods of seasoning at present in vogue consist either in evaporating the sap by air-drying, or in dissolving it in water and afterward sun-drying the timber. Artificial drying is rarely resorted to with timber for engineering purposes. The greatest trouble against which the engineers have to contend are the ravages of the teredo, white ant, and other similar insects, and various means of protecting the wood against these pests are resorted to, the most general being the sheathing of the wood in copper. But even copper sheathing is not permanently effectual in resisting the attacks of the teredo. Creosoting properly carried out is the most successful of any process yet known. The various means of preserving the timber consist of painting, charring, creosoting and impregnation with metallic salts. The latter method, however, has not in all cases given satisfactory results.

Expedition to the Sahara.

Mr. Edward Dodson, a British explorer, has succeeded in traversing the Hinterland of Tripoli, which has hitherto been forbidden country. His expedition was sent out by the Natural History Museum of Edinburgh. Although little enough was gathered that was of any interest from the standpoint of the natural scientist, Mr. Dodson nevertheless succeeded in gaining valuable knowledge of this unknown land and in mapping out parts that have been hitherto but illdefined on our charts. The journey was accomplished not without hardship. Eight camels, three horses and nine Arab servants entered the great desert eight days after leaving the city of Tripoli. Heat and blinding sandstorms, as well as a lack of water, were but a few of the troubles experienced. Water could be obtained only at intervals of from ten to twelve hours. Two weeks after leaving Tripoli, the town of Sofejin was reached, about 120 miles to the southeast. A detour was made in order to reach an old Roman reservoir where it was expected that a supply of water might be found. Mr. Dodson found this reservoir a most wonderful piece of masonry. The cement had not been in the least impaired, and the reservoir was still perfectly water-tight. On the journey to the reservoir dried beds of torrential streams containing great beds of brilliantly colored flowers were discovered. An examination of these flowery patches showed that the plants were of the "everlasting flower" kind. They had been completely dried by the heat and drought.

After their water bottles had been replenished from the old Roman reservoir, the men struck out for the Bonjem oasis, on the desert road to Sokna. Mr. Dodson had hoped to acquire fresh supplies of food at the oasis. He was disappointed. Those who lived in the oasis were almost starving and were compelled to depend on snails and date-palm juice for their sustenance. The miserable huts built by modern Arabs stood out in strong contrast to the splendid buildings erected during the Roman occupation. Like the old reservoir these Roman buildings were in an excellent state of preservation. One of them covered an area of 3,600 square yards and had a gateway 12 feet thick. After four days' intense suffering, the party reached Sokna. For a day and a night they had traveled through an uninhabited desert without water. From Sokna the journey was continued to Murzuk, about 300 miles from the Sahara. On this part of the journey, the Jibil Soda, or Black Mountains, were crossed and the great petrified forest traversed. The Black Mountains were found to consist of large slabs of perfectly black stone. In traversing the petrified forest ten hours were consumed. The fallen trees varied in circumference from 2 inches to 7 feet. That the region was at one time submerged by the sea, was proven by the finding of marine shells. Returning from Murzuk the expedition again passed through Sokna and finally returned to the coast.

A New Type of Steamer.

A working model of a new and novel type of steamship, the invention of Herr J. Brohan, an engineer of Hamburg, has been on view in the Hall of Civil Engineers, Rue Blanche, Paris. The principal feature of this craft is that it is equipped with four propellers, one forward, another just before the rudder, and two at the stern. The vessel is flat-bottomed, but there is a short keel in the center and two false keels forward, to keep the hull off the bottom in case of grounding, and between which the forward screw revolves. The inventor estimates that with a steamer 300 feet long, built according to his design, he could make the passage from Havre to New York in four days.

DECK RIVETER IN POSITION.

PNEUMATIC TOOLS IN SHIP YARDS.

BY WALDON FAWCETT.

Within the past half decade a system of power riveting has been developed in American ship yards to a point beyond that previously attained anywhere in the world. The attempt was first made to use pneumatic compression riveters similar to those used in many bridge shops, but a limited experience sufficed to show that their great weight for the large gaps which are necessary in shipbuilding made it impossible to handle them in a ship on the stocks with either facility or economy.

RIVETER AT WORK ON SIDE FRAMING.

However, the possibilities of a pneumatic hammer consisting of a piston rapidly reciprocating inside of a cylinder and striking the end of a chisel were well known as far as its usefulness for chipping and calking were concerned, and consequently there were inaugurated at the plant of a shipbuilding firm of South Chicago, a series of experiments designed to test its capabilities for driving rivets. This effort was crowned with complete success, and was continued until it was made possible to drive every rivet in a ship with machines which are very light, short enough to go between frames and of small diameter, rendering them portable in the highest degree.

The shell rivets, which, prior to the introduction of these machines, had never been successfully driven by power, are now closed up with the greatest ease and facility, and the work is done both better and cheaper than would be possible by hand. This is a particularly advantageous advance for the reason that the increase in size of ships has rendered the plating so heavy, that to draw it up requires a rivet too large to be properly driven by hand. As indicative of the economy of time secured by the use of these devices, it may be noted that in deck and tank topwork three men and a heater boy will drive from eight hundred to one thousand rivets in a day. The whole operation of driving a rivet is completed much more quickly than by hand and before the rivet has lost its heat, the resulting contraction as the rivet gets cold drawing everything firmly together.

From careful computations made at the principal ship yards on the Great Lakes, and extending over a considerable period of time, it would appear that the economy of machine riveting, adding the cost of air, repairs, etc., effects a saving of from one to two cents per rivet over piecework prices for hand riveting, the degree of economy depending upon the location in the ship and averaging about 1¼ cents. In an ordinary lake steamer of 4000 tons the saving is from $4000 to $5000 over hand work. A record of 450 ⅞-inch rivets driven in a single day by one yoke machine is nothing unusual. At the regular rate for hand riveting, the placing of this number of rivets would cost $15.75, whereas with the machine the cost is $5 for the operatives and 50 cents for power.

Almost all the various kinds of pneumatic machines for ship yard use are characterized by great simplicity of design. Take, for instance, the yoke riveter as applied to bottom work. It consists of a pneumatic hammer mounted in gimbals on the end of a piece of pipe about eight or nine feet long, which pipe is hung by its center to a trolley running inside of another piece of pipe which is bolted to the bottom of the ship. This allows the hammer to be brought to any point in a considerable space of the ship's bottom without shifting. The mounting of the hammer in gimbals allows it to be swung in any direction, so as to get at the rivet from all sides exactly as in hand riveting. A small cylinder connected with the air pipe is provided to hold the machine steady when required, the piston rod being jammed up against the bottom of the ship, and carrying a piece of rubber on its top end to prevent slipping. There is also a radial frame or carriage to facilitate bilge work.

An important class of pneumatic tools is that comprising the chipping, calking and bending hammers. These machines range in weight from 7 to 11 pounds; have a stroke of from 1 to 4 inches at speeds varying from 3400 to 2200 strokes a minute, according to the size. All hammers of this kind require an air pressure of from 70 to 80 pounds, and must be supplied with 20 feet of free air per minute. The heavy chipping hammers weigh 15 pounds and make a 7-inch stroke at a speed of 1200 strokes a minute. Of all the various kinds of pneumatic hammers now in use in ship yards, it is claimed that the 9-inch stroke riveting hammer, weighing 20 pounds and having a speed of 900 strokes a minute, is the most powerful. In many yards a pneumatic holder-on is used instead of the ordinary bar for holding up the head of the rivet. It can be readily put into position, and presses the rivet against the sheet with a force of 1200 pounds with an air pressure of 100 pounds.

Of the air drills, a fairly representative type, such as is in general use in ship yards, is of 35 pounds weight and will drill in cast iron up to 2 inches, or in steel up to 1⅝ inches, the limit for reaming and tapping being 1½ inches. These drills require about 25 feet of free air per minute at 80 pounds pressure. The pneumatic painting machines of the 10-gallon size are now being extensively used in marine work; and sidelight cutters, deck-boring machines and other appliances all have a place in the complete shipbuilding equipment. Every tool has afforded economic advantages in greater or less degree. Often this is intensified by the variety of uses to which the pneumatic tools may be put. For instance, the flat piston type of drill now in use at the Chicago ship yard, which is capable of drilling 3-inch holes in a solid sternpost, can also drill the side of the ship, ream on deck and drill and ream ship plates.

At each of the larger American ship yards several hundred pneumatic tools are now in use. At the plant of a shipbuilding company, whose yards are located in Camden, N. J., there are now in use about four hundred portable riveters, calkers, drills, etc. An air pressure of 110 pounds is carried, supplied by an air compressor capable of delivering 5000 cubic feet of air a minute.

Last Wire of the New East River Bridge Cable Strung.

Shortly before 11 A. M. on Friday, June 27, the last wire of the new East River Bridge was unreeled and carried across the river. It has taken over six months to string the wires, the work having been begun in December last. Each cable is composed of 7696 wires of No. 6 gage. The next step in the formation of the cable will be the process of squeezing the wires into a solid mass of about 18¾ inches diameter, when they will be banded and encased. Each wire is about 3000 feet in length and has an estimated strength of 200,000 pounds per square inch.

SHELL RIVETER WORKING ON THE BOTTOM.

An Ingenious Weapon for Destroying Submarine Boats.

Now that the submarine boat has fully justified its existence as a potential fighting factor, which will exert a far-reaching influence upon naval battles of the future, efficacious destroyers are being sought, for the purpose of nullifying its power and operations. The British Admiralty has been experimenting with a heavy explosive charge, attached to the outer extremity of a boom, and detonated when the submarine comes sufficiently near. Owing to the heavy nature of the explosive charge, a tremendous concussion results, and

SIDE SHELL RIVETING.

experiments have proved that such an explosion would seriously cripple a submarine boat, even if it did not destroy it outright.

But a far more destructive machine for this purpose has been contrived by an English inventor, Mr. Gardner, of London, which when fully developed promises to be a powerful means for fighting the submarine. The basis of Mr. Gardner's apparatus is an application of the transmission of ether waves. The machine is somewhat complex at present, owing to its being in the experimental stage, but in course of the trials which are shortly forthcoming, the inventor anticipates simplifying its mechanism to a great extent.

The greatest difficulty in fighting against the submarine is in connection with the location of the craft, though the difficulty is somewhat mitigated by the necessity of the submarine being equipped with the périscope, to enable it to steer in the requisite direction. But the submarine cannot be destroyed except by such a weapon as a torpedo coming into contact with it and then exploding, but the uncertainty of the torpedo does not render it a very reliable means of destruction.

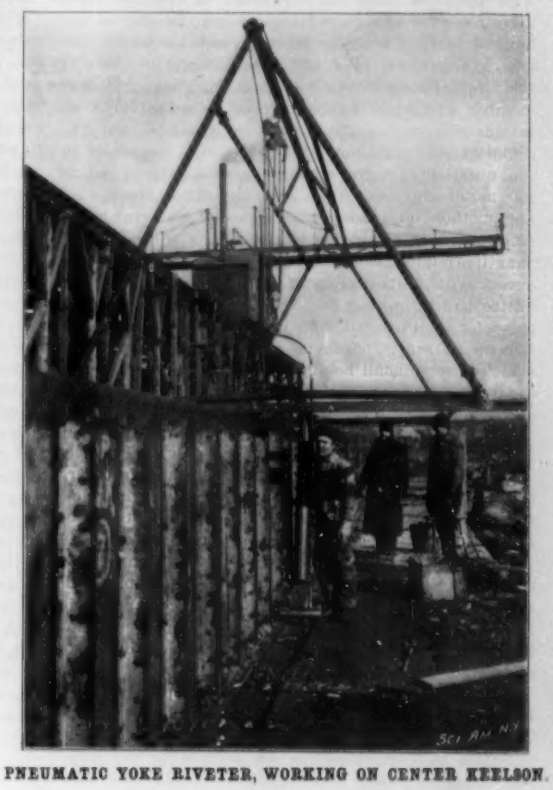
What Mr. Gardner has contrived is, in short, a small submarine carrying no screw, and whose movements are controlled by wireless telegraphy from a fixed point, such as the deck of a battleship. When the key of the transmitter is set in action, the ether waves are arrested by a receiver upon the weapon, and conveyed to a small electric motor, which is thus set in motion. It must be explained, however, that the energy for propelling the motor is not transmitted through the air, but the etheric waves control the action of the energy upon the little craft. The motor in turn drives a centrifugal governor. This contrivance is best explained by saying that it resembles a short rod with a pair of open compasses on each side of it. One leg of each pair of compasses is fixed to the rod, which the motor causes to rotate. The other leg terminates in a heavy metal ball. As the speed of the peripheries of the governors is increased, the balls exert a stronger tendency to pull outward, and the force so generated is communicated to a series of switches, each of which represents an action to be controlled. For example, if the governor is revolving at a particular velocity, a certain switch is opened; but if the rotatory motion be either increased or decreased, then other switches are opened. So perfectly is the mechanism fitted together that the speed communicated to the governor can be graduated with the greatest precision. For instance, if depressed for two seconds, then raised for six, the governor rotates at a certain speed, and a particular switch is opened. If the key is depressed and raised alternately for equal periods of time, another switch is opened, and so on. The relative proportion of the time the key is depressed and released enables the operator to determine exactly which switches are to be opened and closed respectively.

When the weapon is launched, the propelling machinery is set in motion when the object of attack is observed; and by means of a chart the operator is guided in his manipulations of the transmitting key, in order to deviate his weapon from the straight course either to the right or left, as the case may be, to the correct point. By this means it is possible to follow the course of the submarine with facility, and as the weapon travels at a far greater speed than the submarine, the latter is soon overtaken. Directly the pursuing boat comes within sufficiently close range, the operator opens a switch, and the 200 pounds of guncotton which the small crewless submarine carries, is detonated. The force of such a concussion a short distance from a submarine boat would crush in the sides of the craft—the only efficacious means of destroying it.

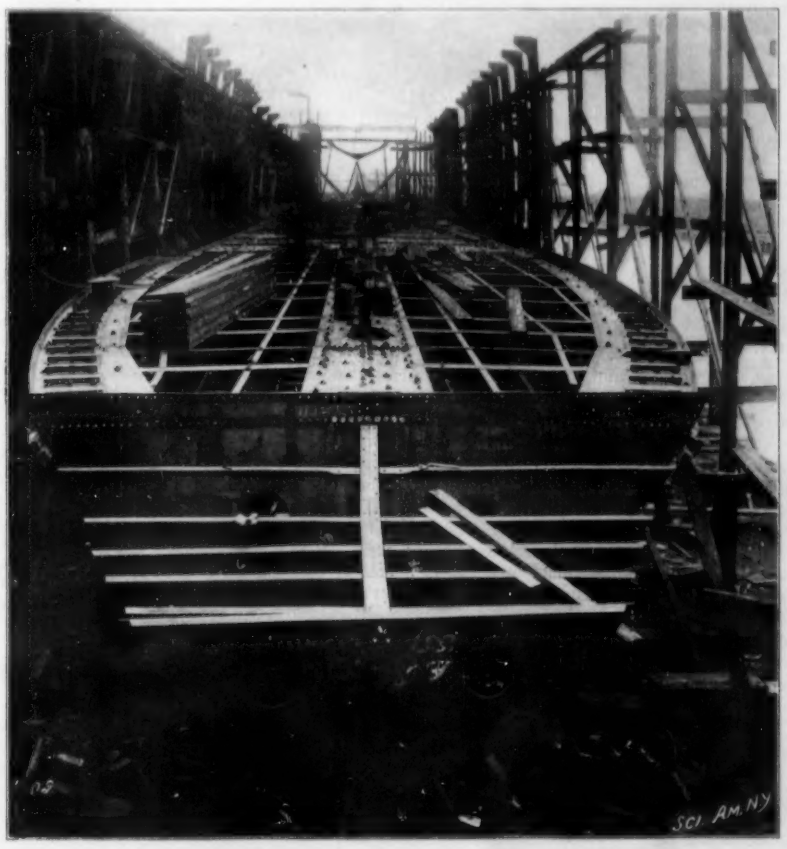
The inventor has completed an experimental weapon, and the British Admiralty propose to submit it to severe trials to ascertain its full value, as the discovery of a satisfactory antidote to the submarine is engaging the earnest attention of the English navy.

The Government Report on the Vibration of the London Electric Railway.

The report of Lord Rayleigh, Sir John Wolfe Barry and Prof. Ewing, who were appointed by the Board of Trade a few months ago to be a committee to investigate and report to what extent the working of the traffic on the Central London Railway produces vibration in the adjacent buildings, and what alterations in the conditions of such working or in structure can be devised to remedy the same, has just been issued. As a first step, the committee satisfied themselves by personal observation that vibration sufficient to cause serious annoyance was actually felt in many of the houses situated along the route of the railway. A very little experience further showed that the disturbances due to successive trains were very unequal. The results analyzed by Mr. A. Mallock, who was employed by the committee for the purpose of conducting the details of the investigation, showed (*a*) that it was a matter of chance whether a given train caused a slight or a severe vibration; (*b*) that trains causing a severe vibration in one house were as likely as not to cause only slight vibration in the others; (*c*) that different rooms in the same house were not similarly affected by the same train. One of the most distinct indications from Mr. Mallock's records, was the responsibility of the locomotives, as distinguished from the carriages, for the worst part of the disturbances, and the attention of the committee was called at an early stage to the excessively large load, unrelieved by springs, carried on each axle of the locomotives. The unspring-borne load carried on each of the four axles of the locomotive is 8 tons, making 32 tons in all. This construction was adopted in order to obviate the necessity for gearing, and the committee could not but connect the difficulty with the magnitude of this unspring-borne load. From measurements made by Mr. Mallock there was reason to believe that the principal source of disturbance lay in the unevenness of the surface of the rails. The irregular impulses given by uneven rail surfaces had the effect of establishing and maintaining an oscillation of the rails and roadbed, the whole being regarded as an elastic support loaded with those masses which are not carried with springs. The new locomotives were ready for trial in August last, and were of two types. In one, the locomotive was, as before, distinct from the passenger cars, but gearing was introduced so that the electric machinery was no longer mounted directly upon the driving axles. The unspring-borne load was correspondingly reduced, and amounted to 2½ tons on each axle of the old locomotives. This type, of which there were three specimens, was described as the "geared locomotive." In the other, the "multiple unit" or motor-car system, the locomotive was not distinct, but motors were carried at one end of two or more passenger cars. In this case the unspring-borne load on each axle of the truck under the motor car was 1¾ tons. Observations in the tunnels made by Mr. Mallock for the committee showed, as had been expected, a great improvement. The vibrations in the ground decreased in proportion to the reduction of the unspring-borne load; for the geared locomotive they were less than one-third, and for the motor car train less than one-fifth, of what were caused by the ordinary locomotives. In view of these results the committee recommend the adoption of a type of locomotive or motor in which the load not carried on springs is reduced as far as



PNEUMATIC YOKE RIVETER, WORKING ON CENTER KEELSON.



PNEUMATIC RIVETING—WORK ON THE DOUBLE BOTTOM.

possible. This might be arrived at by using gearing as in the geared locomotives or motor carriages, or by using a gearless locomotive in which an elastic connection is employed between the driving axle and the motor; but the committee had no opportunity of experimenting with a locomotive of this type. In the trials carried out the motor cars were found to have an advantage in freedom from vibration over the geared locomotive. So far as the Central London Railway is concerned, the committee are confident that by adopting motor cars in place of the original locomotives the vibration produced by the running of trains can be reduced so as to cause no serious annoyance, although it is possible that the sound of the trains may still be detected, especially in the night. They are able to speak positively as to the motor cars, but they entertain little doubt that any method of driving in which the unspring-borne load on each axle is reduced to a similarly small quantity might also be used with impunity. On the question of the best form of rail and sleeper the committee had no decisive evidence. They were disposed to prefer a stiffer rail than that in use on the Central London Railway, and advise in new undertakings that sufficient room shall be allowed for the introduction of a deeper rail.

Prize for Method of Drying Potatoes.

The German association of alcohol manufacturers and the association of agriculturists have jointly offered a prize of 30,000 marks ($7143) for the best method of drying potatoes for feed for cattle, etc.

German agriculture has been increasing its potato crop very largely. The technical progress made in cultivating potatoes and the choice of certain kinds yielding a larger crop have made it apparent that Germany will continue to have a surplus of this vegetable.

Already, 40 per cent of the total crop is used as fodder; but as potatoes deteriorate after six or seven months, they must be fed within that time. Transportation also, is expensive, on account of the large percentage of water they contain. Three and one-half tons of fresh potatoes yield a ton of dried ones. It is predicted that a good method of drying potatoes will greatly benefit German agriculture, and it is intended to use the process on a large scale.

Particulars for this prize contest can be had by applying to the "Institut für Gährungsgewerbe," Berlin, N. 65 Seestrasse.

The Current Supplement.

An important article on the Braun-Siemens-Halske wireless telegraphic system which is so strong a rival of the Slaby-Arco system in Germany opens the current SUPPLEMENT. The article is illustrated not only by clear diagrams, but by handsome half-tone illustrations. Havelock Ellis, who is well known as one of the foremost living biologists and psychologists, tells us something of the mysterious plant mescal and of the peculiar visions which it calls forth when taken into the system. An article on volcanoes is of timely interest. Archæologists will be pleased to learn something of the excavations in Crete and of the work done by the German Archæological expedition at Babylon. Prof. S. P. Langley, in a thoughtful lecture, discusses the laws of nature. "Sleep-Producers" is the title of an essay by Dr. Kellogg. The recent paper read by Bion J. Arnold at the convention of the American Institute of Electrical Engineering on the practicability of using electric power for traction on the New York Central Railroad within the limits of New York city, is published in full. The Consular Reports and Selected Formulæ are given as usual.

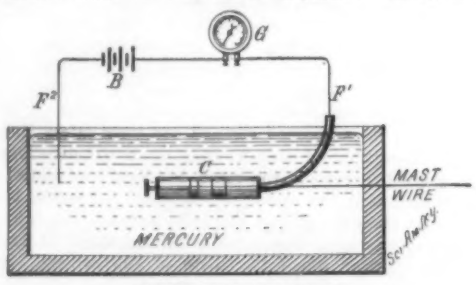
Shot by an Esquimo Hunter.

Wild geese and brants are known to travel, during the migratory season, very far south. Recently a large wild goose was killed not far from Spokane City, Wash., which had evidently winged its way from the remote Eskimo lands. When the hunter picked up the bird he was surprised to observe a slender piece of ivory protruding from its breast just below one of its wings. With much difficulty he succeeded in pulling out the piece, for the flesh had grown tightly around it. It proved to be an arrowhead, about eight inches long, which had some queer carvings on the stem where it had been fastened to the shaft. The carvings were delicate, though quite distinct. On a careful inspection by some Klondike miners the carvings were pronounced to be of Eskimo origin. No arrowpoint of that kind was ever known to have been used by the Indians of Washington or British Columbia. The head was of fine ivory, no doubt carved from a walrus tusk. Evidently the goose had been shot by an Eskimo hunter in the Arctic regions, the wound had healed, the flesh had grown around the weapon, and in its long flight the bird had no doubt broken off the arrowshaft.

J. MAYNE BALTIMORE.

EXPERIMENTS WITH ELECTRO-MAGNETIC WAVES ON MONT BLANC.

M. Charles Nordmann, in a paper read before the Académie des Sciences, gives an account of some experiments which he made at the Mont Blanc observatory in order to determine whether waves of an electro-magnetic nature are given off by the sun. It seemed possible that a source of luminous and calorific energy should emit electro-magnetic waves, as these are now recognized to be of the same nature. M. Nordmann chose an elevated point for carrying out the researches in order to eliminate as much as possible the absorbing action of the atmosphere, and especially that of water vapor, and installed an experimental post at the Grands-Mulets, a point at 9570 feet altitude. To receive the waves he used a horizontal mast wire 550 feet long which was laid along the Bossons glacier upon wood insulating supports so that the sun's rays would fall directly upon it. The choice of the glacier for the support was of considerable importance. The ice can be considered as a reasonably good insulator; M. Janssen has shown this in his recent experiments on Mont Blanc. Ice is transparent to the electro-magnetic waves. The ice in this case was 80 feet thick and the sun's rays (at the autumnal equinox) were inclined from the vertical, thus avoiding a possible error arising from interference. Nordmann used a coherer which was placed in a vessel of mercury which formed an opaque medium for outside disturbances. The coherer, C, has one pole in contact with the mercury and the other, F_1, insulated from it and passing above to a galvanometer and battery circuit, with a return wire, F_2, to the mercury. The wire, F_1, is surrounded by a metallic sheath which acts as a screen. The mast-wire is uninsulated and passes through the mercury to the coherer. Thus the coherer was carefully sheltered from any external disturbance. It was then regulated while still under the mercury by a regulating screw and the galvanometer brought to zero. The mercury was then allowed to run out by a tap and the coherer left free. Under these conditions the experiment was repeated several times on the 19th of September during fine



NORDMANN'S APPARATUS.

weather, but all the results were negative and no deflection of the galvanometer could be obtained. This seems to prove that the sun does not emit such electro-magnetic waves as can be propagated along a wire and act upon a coherer; or in the contrary case such waves must be absorbed by the sun's atmosphere or the upper atmosphere of the earth. It is well known that rarefied gases have a powerful absorbing action upon such waves, but the object of the experiment was to see whether a part of the waves did not escape this absorbing action and penetrate to the surface of the earth.

Periodic Comets of 1902.

Astronomers expect the appearance of two periodic comets during the present year. The first of these was discovered by Temple at Marseilles on the 27th of November, 1869, and returns every 5.5 years. Its period was only known, however, after the rediscovery of the comet on the 11th of August, 1880, by L. Swift, for in 1875 it was not favorably placed for observation, and the same on its return in 1886 and 1897. In 1891 it was but feeble, and was observed for the first time on its return by Barnard on the 27th of September, with the Lick telescope. It will be in a better position for observation in the first part of December next, when it is expected. The second of the periodic comets has an interesting history. It was discovered by Swift on the 20th of August, 1895, and calculation assigns it a period of about seven years. It is remarkable that this comet seems to be identical with the one discovered on the 14th of June, 1770, at Paris by Messier, who was called the "ferret of comets," because he had observed a greater number than any astronomer of his time. Lexell had calculated its orbit and supposed that as its period was 5.5 years it would come back at the end of 1775; but he did not find it, in spite of all his searches. Schulhof is of the opinion that the comet in passing near the planet Jupiter, whose mass is considerable, has undergone great modifications in its movement, and that the comet described by Swift is the same as the so-called "lost comet" of Lexell. Its return is expected in November, when it will be near the sun and in a good position for observation.

Correspondence.

Cheap X-Ray Tubes.

To the Editor of the SCIENTIFIC AMERICAN:

It may be of interest to some of your readers to know that experimental X-ray tubes can be made out of ordinary lamp globes. The two electrodes are made of sheet aluminium, and are about ⅞ inch in diameter. The aluminium may be got for these from any dentist's supply house. About No. 20 gage is best, and should be soft. They are hammered out until they very nearly fit the tube. Then they are shellacked onto the outside of the tube at as nearly opposite points as possible, and held in that position by weights until they are dry. After it is perfectly dry, the tube should be run until the shellac is melted, and then allowed to cool, while the electrodes are pressed tightly against the tube. After the shellac has solidified, the tube may be run for short intervals until it is working properly and generating X-rays.

These tubes work best on a high-frequency coil, although they may be run on an induction coil. When run with the latter, the anode should be a little larger in diameter than the cathode. The connection to the coil is best made by means of stiff wires held by binding posts. An ordinary socket will serve as a support for the tube while it is being used. With a tube made from a 32 C. P. globe (it would make no difference if it is burnt out) the bones of the arm and hand may be plainly seen.

M. EASTHAM.

Oregon City, Ore., June 9, 1902.

Lord Kelvin on the Molten Earth.

To the Editor of the SCIENTIFIC AMERICAN:

I have doubted if many of us have recognized the deep significance of Lord Kelvin's contention that, "when the earth was in a molten state, it was surrounded by an atmosphere of nitrogen and carbonic acid gases, but *with no free oxygen*." I for one am happy to take this learned man's word on this problem, for he seems to have unlocked the gateway into a marvelous field for the scientific adventurer.

If the earth had no free oxygen during the igneous era, we stand face to face with the time and place of *primitive oil-making*. Assuming that the earth's immeasurable fund of carbon and hydrogen, which it now has in store, was in that great world-furnace then, how are we to avoid the conclusion that it was the one grand opportunity for the formation of a world's hydrocarbon such as we find in the earth's crust to-day?

The less oxygen our furnaces and coke ovens get, the greater the deposit of sooty, oily carbon matter in our smokestacks, which as miniature oil and fuel depositories, take fire and burn. From this it is but a scientific step to the conclusion that a vast amount of the carbon and hydrogen of a world, made hot by the implacable heat of chemical and mechanical processes, went, through mineral fire-mist, to the terrestrial heavens as an *unburnt* hydrocarbon fuel. Even with free oxygen present it could hardly have prevented the molten earth from posing as a *smoking world*, which means oily carbons sent to the skies.

Now we find an almost limitless fund of unconsumed allotropic carbon among the aqueous formed strata, and I presume Lord Kelvin knows this as well as anyone, but the great problem was, and is, how to account for the existence of these igneous distillations so far above the igneous beds. If we can leave old paths long enough to see all these and other fiery exhalations sent to the skies and formed into a Saturn-like *annular system*, as a revolving earth appendage, where they lingered till the earth grew cold and then came back in grand installments as the ages rolled on, the first decade of this twentieth century may see a happy solution of this tantalizing problem. As annular world-deposits they are philosophically in place to harmonize with Kelvin's matchless deductions.

In the strictest sense this is not a secession from the current school of geologic thought. It is simply a hesitation longer to follow the empiricism which makes the organism the only source of the hydrocarbons, discarding the basic fact that millions of years before a fish or mollusk lived in the seas, there was an all-competent oil-making furnace, as far ahead of the secondary organic source as the energies of a molten earth surpass the puny efforts of the decaying organism. The contest is between Lord Kelvin and the organic school.

ISAAC N. VAIL.

Pasadena, Cal., May 26, 1902.

The Western Automobile Endurance Test.

The Automobile Club of Chicago will conduct a 100-mile endurance test open to all kinds of self-propelled vehicles on July 12. The course will be along the shore of Lake Michigan to Waukegan and return. The endurance run will be the first to be held in that section of the country, and it should offer excellent opportunities to the many new Western automobile firms to demonstrate the good qualities of their machines in an actual test on the road.

Science Notes.

The Andrew Carnegie gold medal for 1902, of the Iron and Steel Institute, has been awarded to Dr. J. A. Mathews, of New York, for research carried out by him as the holder of an Andrew Carnegie Research Scholarship during the past year. The medal has been designed by Mr. G. W. de Saulles, of the Royal Mint. Dr. Mathews previously received a Fellowship for the encouragement of scientific research from Columbia University in this city, where he has been working under the guidance of Prof. H. M. Howe.

Verily the German is ingenious. The astronomical loot carried off by the men of Count von Waldersee, and sent to Berlin from China, is regarded by the astute Teutons in the light of a "present." Such at least was the view set forth in the recent speech by the Imperial Germaň Chancellor before the Reichstag, who remarked that: "The instruments have not been restored because the Chinese government attaches no importance to their possession, and in reply to German inquiries it placed them at the disposition of the German government. Another consideration is that, in accordance with the peculiar views of the Chinese, the great mass of the people would have supposed that the instruments were restored by order of the Chinese government, which would have damaged German prestige in East Asia. The Dowager Empress of China, a very clever woman who understands the political situation, would have been distinctly offended (why? we ask), while the masses would have thought that Germany had sustained some terrible defeats. The instruments ought now to be placed in the category of presents from government to government, which has long been customary on both sides in our intercourse with China." Assuredly, this would make the great Napoleon, who, it will be remembered, had a very nice taste for art treasures, and did not scruple to carry them from the Vatican into France, turn green with envy.

A valuable discovery of far-reaching importance to the cotton-manufacturing industry has been made by Dr. W. H. Perkins, of the Owens College, Manchester, whereby cotton and other similar highly inflammable materials can be rendered permanently fireproof. The discovery has been achieved after two thousand experiments extending over many months. With the exception of explosives, there is no article that flares up so quickly as cotton when it comes into contact with a light, especially in those particular goods which are made of heavy yarns and "combed out" on both sides in order to give the appearance of flannel. The fireproofing process consists of "asbestinizing" the fabric, by which means permanent immunity from burning is assured, but the exact manner in which it is achieved is not divulged. In order to realize the full importance of the discovery, it should be understood that "asbestine fabrics" can be washed and washed, and yet retain their non-ignitable quality. From this it will be seen that the process is not that of merely putting upon the material a chemical that for the time being renders the fabric non-inflammable, but rather that, as in the case of "mercerizing," the very character of the material is changed. From the scientific point of view much interest attaches to this feature. Already inquiries are coming from Germany as to the process, for in Europe these highly inflammable cotton goods are largely produced. It should be added that "asbestined" cloths are perfectly hygienic, and can be safely worn next to the skin.

A few years ago the Russian Prince Abemalak Lazareff, during his visit to the ruins of ancient Palmyra, discovered a large block of stone, about 12 feet long and 8 feet wide, containing a well-preserved bilingual inscription,.i. e., Greek and Palmyrene, which is supposed to date from the third century of our era. The inscription is said to contain the tariffs of custom duties and taxes levied during that period, divided into three tables. Last year the authorities of the Imperial Russian Museum at St. Petersburg sent Prof. Uspensky, of the Russian Archæological Institute, who resides at Constantinople, to Palmyra, with other experts, to report on the inscription and to ascertain whether it was possible to cut it out from the huge block. The professor having reported on the feasibility of the undertaking, the Russian government obtained the Sultan's sanction to remove it to Russia. Accordingly, an expedition was sent to the spot last summer, composed of workmen under the superintendence of a Russian consular official, and after cutting the block of stone into three parts separated the inscription from each, and it is now on its way to the Russian capital. Palmyra, or Tadmor, as it is now called, is famous for the ruins of the Great Temple of the Sun. It was an important commercial place, being a depot for silk and other Asiatic and Indian products; and, on account of its copious spring, it must always have been a halting place for caravans passing through the Syrian Desert. It attained the height of its glory and prosperity in the third century, under Queen Zenobia, wife of the Emperor Odenathus.

Automobile News.

M. Serpollet has sold his famous "Easter Egg" racer, with which he made the record at Nice, for $11,000, and is already at work designing a new racer for 1903. He wishes to prove by this type that he was right in devoting so much energy toward the problem of steam as applied to the automobile, and expects to establish it by a striking demonstration. His new racing machines are to weigh less than 2,200 pounds, and will make seventy miles an hour as an ordinary thing. The voyage from Paris to Bordeaux could thus be made in five hours, and the machines would only need to stop for provisions every 300 miles or so. It is to be hoped that the distinguished inventor will be able to carry out his promise.

The Russian Etat-Major is continuing its tests upon automobiles for army service. During the maneuvers of the Russian army in 1901, a 6½ horse power machine was used in the operations which took place in the neighborhood of Siedletz in the Warsaw district. The ground was in very bad condition. According to the report which was made on this vehicle, it was only able to circulate over a single route. It was used for transmitting orders from the rear of the column to advance-guard or for the transport of the chief of the detachment in order to reconnoiter his own positions or those of the enemy. The average speed over the road was 12 or 13 miles an hour. During the ten days of the maneuvers the automobile covered a total distance of 640 miles, running day and night. It had to stop for repairs twenty-eight times. According to the report, the army will make a more extensive series of tests during the present year.

A road locomotive for military use is to be made the subject of a concourse organized for next year by the Minister of War and Minister of Agriculture of Germany. The tractor, which is to utilize alcohol, is to be constructed on the lines of the now-existing steam tractors, and is designed for the transport of cannon or other military supplies. The conditions under which it has to operate are particularly hard, as will be seen from the following requirements. The tractor is to carry a load of 7½ tons on one axle and 5 on the other, and must be able to draw a gross weight of 15 tons up a 10 per cent grade at the rate of 3 miles an hour. On a level it must make 5 miles an hour and be able to cover 42 miles in a day's journey, carrying all the supplies necessary for the trip. The tractor must be able to mount alone a 20 per cent grade, and be provided with a hoist by which it can draw up the trailers after it; its own weight is to suffice for this operation without requiring an anchorage. The tractor must be able to run upon bushy or plowed ground, snow and ice, etc., and sink in the ground no farther than will allow the mechanical parts to clear the soil. It must also cross streams having 16 inches depth. The motor is to use pure alcohol, but a small amount of gasoline is allowed for the starting. It must be adapted for other liquid combustible by a change in the carbureter. This competition is not international, as one of the stipulations is that the tractor must be of German make. It will be submitted to a three weeks' test under the direction of competent authorities. The tractor, besides, must fulfill in general all the requirements of military service. As will be remarked, the conditions are unusually difficult.

Some instructive data as to the imports and exports of automobiles in France are given in the Bulletin of the Chambre Syndicale de l'Automobile. The values for the imports (obtained from the weight by allowing $2 per kilo, or 2.2 pounds) are as follows for the four years, 1898-9-1900-1901: $79,000, $94,600, $103,400 and $135,600. The increase in the importation thus follows the general increase of the automobile industry. The imports, which are relatively small, come principally from two countries, Wurtemberg for the petrol vehicles and America for the electric. The Daimler Company at Canstatt, near Stuttgart, sends into France petrol automobiles *de luxe* at a price of $3,000 to $4,000 each. Two American companies, Columbia and Riker, send electric automobiles to France, both complete machines and also trucks carrying the motors. The latter are valued at $600 to $800 each. The carriage work for these trucks is put on in France. This latter importation is due to the fact that the American trucks are made on standard pattern and in quantities at a low price. As to the figures for the exports of automobiles from France, the following figures show the increase for the same four years: $350,000, $852,000, $1,883,000 and $3,156,000. The figures for 1901 are thus 69 per cent in advance of the preceding year, and show the increasing popularity of the French automobile and the good condition of the trade. The rate of valuation above used is somewhat small for the racing machines and *voitures de luxe*, which while weighing only 2,000 pounds, sell for $5,000 to $6,000, but it is about correct for the current types of automobiles which form the largest part of the exportation. It is estimated that the number of workmen employed upon the vehicles for export alone reaches 7,000, and in 1902 it will doubtless be much greater.

Electrical Notes.

Schmidt, in comparing the economical value of coal and electricity as sources of energy, arrives at the conclusion that on the average only 30 per cent of energy is utilized in the former case, whereas in the latter case this percentage is 90 per cent. For this reason he recommends that electrical heating be used in the manufacture of water gas, instead of the usual process of supplying the necessary heat by direct combustion under air blast. He bases his calculations on the economical conditions existing in Switzerland, and expresses the opinion that it would be easy to adapt carbide furnaces to the manufacture of water gas.

The telephone exchange at Hamburg, one of the largest in Germany, is equipped with a horizontal switchboard, which is said to have many advantages over the ordinary upright type. The principal advantage claimed for it is an economy in the number of jacks required and the length of board, and consequently in the space occupied. As the sections are horizontal instead of vertical, operators can work from both sides of the board, and, theoretically at least, each section can carry twice the number of answering jacks that a vertical board can. It follows, therefore, that for a given number of lines a horizontal board is only half as long as a vertical board, although it must occupy more ground space breadthways. These horizontal boards are made by a German firm, who have supplied a large number for the Imperial German Telephone Department. It will be remembered that the Glasgow municipal board is of this horizontal type.

Some time ago it was stated that the Edison magnetic ore extraction process was to be installed by certain English steel manufacturers in the various iron ore districts of Norway. Arrangements have now been completed for the erection of a complete magnetic apparatus at Dunderland, Norway. In this district there are immense deposits of iron ore, but it only averages about 40 per cent of metal to 60 per cent of gangue. It would not be lucrative to ship the raw ore to the smelting furnaces of England, but it will be possible to work the ore profitably by the Edison extraction process. Each unit of the apparatus contains two 250 magnets of varying powers, and is capable of dealing with a ton and a half of crushed ore per hour. The employment of this process will exercise a far-reaching influence upon the iron and steel industry of the United Kingdom. For some time past the home supplies of iron have been getting shorter, and there have been indications of deterioration in the quality of the iron ore from Spain, whence a large part of the crude metal is obtained. With a practically inexhaustible supply of pure iron from Norway, at a relatively cheap rate, British iron and steel makers will be in a position to compete more successfully with this country and Germany than they have recently. As freight charges are reduced 60 per cent by the elimination of 60 per cent of dross, the carriage of which in the form of ore has to be paid for, the pure iron will be accessible to the English iron and steel makers at a price which will make them independent of any other source.

Herr Ewald Rasch describes in the Elektrotechnische Zeitschrift an arc light obtained by the use of solid refractory electrolytic electrodes which have to be heated to start with as in the case of the Nernst lamp. With electrodes 2.5 mm. diameter a pressure of 50 volts and a current of 2 amperes, 630 Hefner candles (horizontal) was obtained, and with electrodes 5 mm. diameter and 5.3 amperes at about 42 volts, 900 candles was given out, or about 4 candles per watt in each case. Experiments were made with 2.5 mm. electrodes, varying the current. With 1.1 amperes at 65 volts the candle power was 146. The current was then gradually increased to 5 amperes when the voltage dropped to 45 and the candle power increased to 1,012, but at this stage the electrodes fused; in fact, it was advisable for steady working to keep the efficiency down to from 3 to 4 candles per watt. The author points out that Tumlirz, in his paper on "The Mechanical Equivalent of Light," gave the ideal efficiency as 5.21 candles per watt, and as a result of these experiments it was found that the highest efficiency obtained was 5.2 when the metal fused. It must, however, be pointed out that the electrodes become convex so that probably the greatest illumination would be horizontal. No tests of the spherical candle power are given in the paper. Dr. W. Nernst, referring to this article in the Elektrotechnische Zeitschrift, attaches considerable importance to this point, which in his opinion militates against the employment of Dr. Rasch's electrolytic arc, and makes its efficiency no longer phenomenal. He further remarks that no figures are given in Dr. Rasch's article for rate of consumption of the electrodes. His own experiments, with electrodes of a material similar to that employed in his incandescent lamp, showed that the negative and not the positive electrode burns away the quicker (a phenomenon which he thinks may have an important bearing on the theory of the arc), and that the quick consumption would prevent the construction of a practical lamp on these lines.

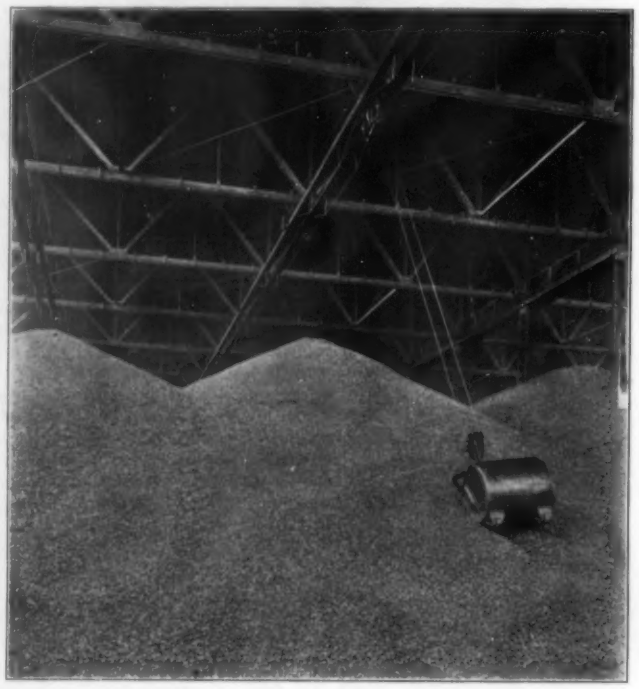
RAPID TRANSIT OF MATERIAL.

BY DAY ALLEN WILLEY.

The changes that have taken place within a comparatively few years in the mechanism for the handling of material at the factory, in the storage yard and at the docks, have been productive of truly marvelous economy in time, labor and cost. One of the best known of the modern systems for the mechanical handling of material is the Brown hoist, which has been developed into a variety of forms, of which the bridge tramway plant is the best known. This device is principally used in transferring ore, coal and other material from the car or vessel to the storage pile, and is composed of steel trusses supported upon towers which move along tracks. The tramways are provided with hinged aprons, which project over the car or vessel, and with cantilever extensions at the opposite ends. The buckets serve a space 300 to 350 feet in width if desired.

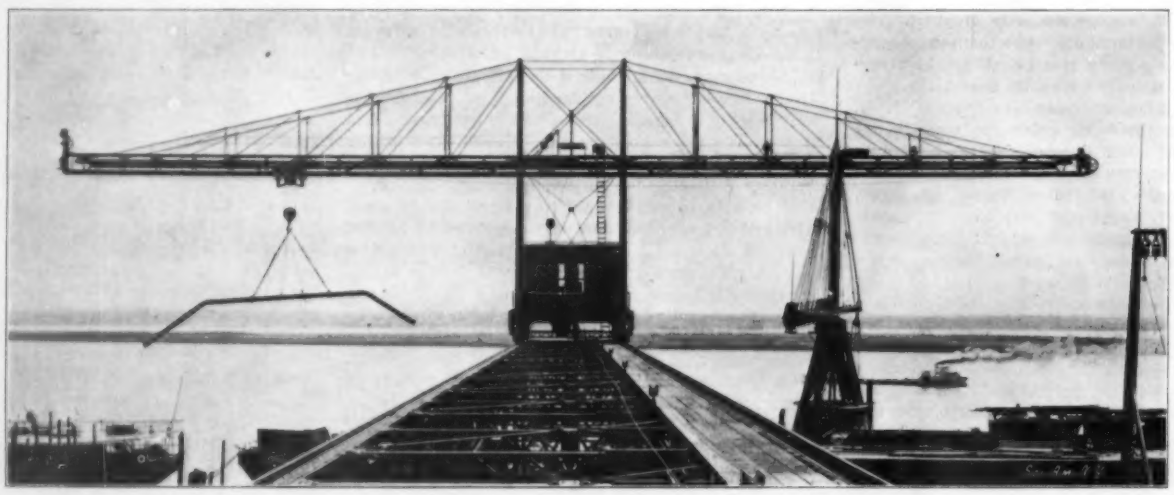
The equipment for handling ore consists of an automatic dumping-tub or bucket, attached to the "trolley," which is the popular name for the hoisting and conveying machine proper. The trolley, running along the track suspended from the bridge, can be moved to the end of the apron, or of the cantilever, or to any intermediate point, at the will of the operator. It is moved by means of a wire rope and a drum in the engine house. The engine is usually of the double-cylinder type, and is built for heavy service. Levers are provided, allowing it to be quickly controlled by the operator. In handling fine material, such as nut coal and sand, a self-filling and dumping "grab bucket" is employed. The machinery is installed so compactly that one engine is usually sufficient for three or four of the bridges. The plan of operating the trolley and controlling the transfer of the load is described as follows: At a given signal the operator throws a lever and hoists the bucket at full speed through the hatch of the vessel, or out of the car, the bottom block hooking automatically into the trolley. The trolley now carries the bucket to a point along the bridge or cantilever extension, where dumping irons have been previously placed, which automatically trip the latch of the bucket, allowing it to upset, discharge its load, and automatically right itself. The operator then releases his lever and allows the bucket to return by gravity to its starting point. The block unhooks automatically from the trolley, allowing the bucket to be lowered into the hold, where the empty bucket is unhooked and a filled one hooked on.

A plant of three bridge tramways will hoist and dump on a dock 1200 tons of ore per day of 10 hours, moving the material for 150 or 200 feet. This is the speed under ordinary conditions, but the capacity can be increased if the buckets are filled and attached to the trolley as rapidly as the machinery can be moved, which is seldom the case. A rate of 45 seconds per trip has been made in testing one of the tramways. The "fast plant," as it is termed, is a modification of the bridge tramway, and is utilized where space is limited and no storage room afforded. It is intended for loading directly from vessels to car and *vice versa*. The "bridge" is limited to the arms or cantilevers extending over the deck of the vessel and the railroad tracks. As the distance to be covered is very short, the time required for transferring the material is less than by the former method. The engine is usually located in the framework of the supporting pier in order to save space. The tower or pier is mounted upon rails, so that it can be moved to any portion of the wharf desired by its own power. The arms vary in length. In large plants they are capable of serving cars upon five parallel tracks and extend a distance of 80 feet from the supporting tower. The plants herewith illustrated are in use at the piers of the Pennsylvania Railroad Company at Cleveland, Ohio. Each has a capacity for lifting a load of five tons a distance of 300 feet per minute, and trolleying it at the rate of 1,000 feet per minute. The photograph shows a series of six operated by two engines having a combined capacity for transferring 2000 tons per hour when all are working at full speed. By their use five trains of cars can be loaded at one time.

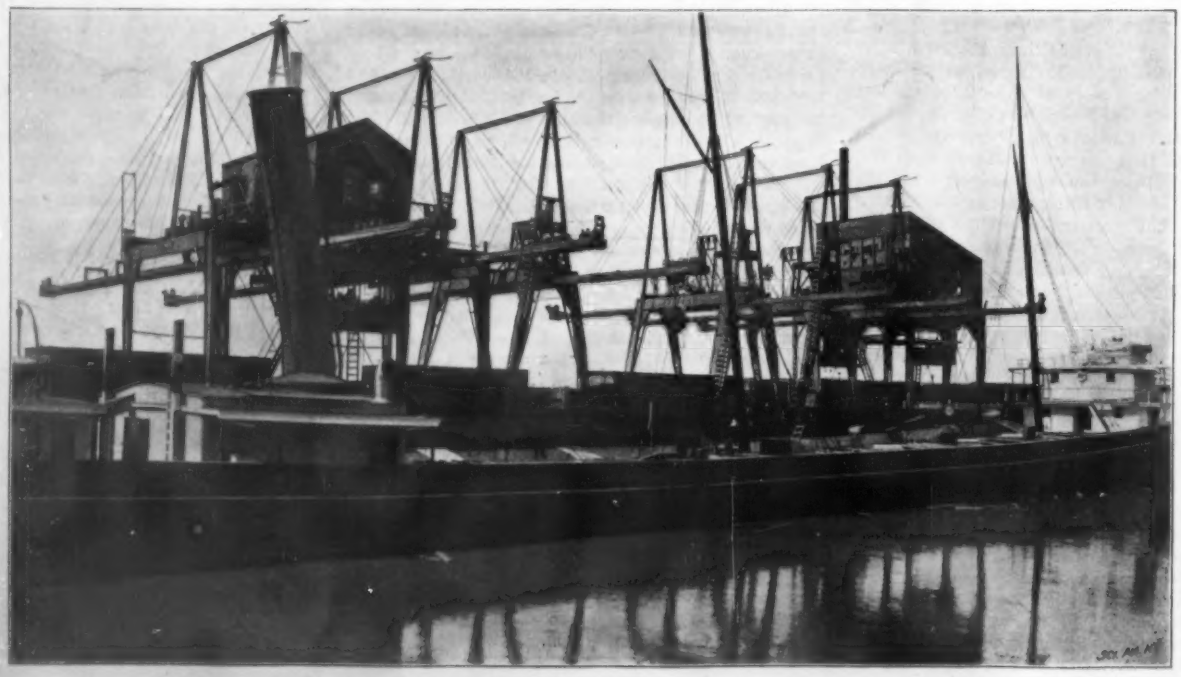


Bucket Shovel in Coal Storage and Rehandling Plant at Cheektowaga, N. Y. Capacity of Shed, 250,000 Tons.

In storing of ore by machinery, a modified form of the bridge plant is used, and so placed that it serves not only the storage yards, but the furnaces, if the latter are adjacent. If the furnaces are inland and receive their supply by rail, the bridge is constructed so that the cantilever or apron will extend over the tracks, the material being transferred to the storage pile or the smelter as desired. This type of bridge plant is the largest in use in this country, as it must be adapted to cover a wide area. The bridges illustrated are a portion of the equipment of the Carnegie Steel Company at Du Quesne, Pa. They are operated by electric motors, and serve a storage space 233 feet in width. The tubs are of five tons capacity each, what is known as a "shovel bucket" being used in taking the ore from the yard to the furnace. Each plant will store from 2,000 to 3,000 tons in a day of 10 hours, and transfer from yard to furnace from 1500 to 2000 tons in the same time; yet but one man is required to operate each trolley, and one engineer each engine.



Electric Cantilever Shipbuilding Crane; Serves Two Shipways, One on Each Side.



"Fast Plant;" Modified Form of Bridge Tramway for Unloading Direct from Car to Ship without Storage.

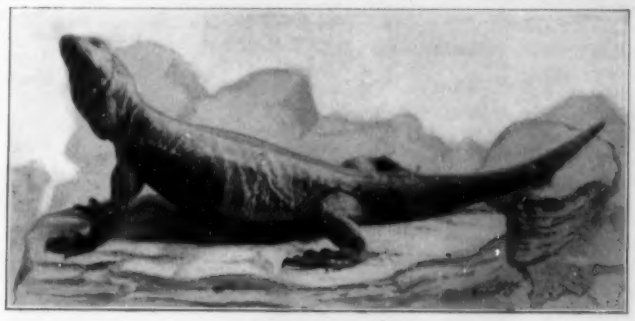
The storing of coal in yards and warehouses offers an extensive field for the use of apparatus such as we have described. The invention of the bucket shovel, already alluded to, has provided a means by which any tonnage desired can be moved

in an incredibly short time. In place of the ordinary bucket, the shovel is attached to the trolley rope, the latter traveling on overhead tracks, suspended from the roof of the storehouse or from a bridge tramway. The operator at the lever controls at all times the motion of the bucket. This method is being extensively used in the Pennsylvania anthracite regions for loading cars from storage piles, and at the breakers. It is also in vogue for handling coal under roof, the illustration showing the interior of the plant of the Philadelphia & Reading Railroad Company at Cheektowaga, N. Y., near Buffalo. This is one of the largest coal sheds in the country, being 674 feet long and 354 feet wide, while the trolleys are operated at an elevation of 80 feet above the floor, allowing the material to be piled to a height of 70 feet. The total storage capacity is 250,000 tons, and with the equipment of the shovel buckets provided, 3000 tons can be transferred in 10 hours.

Another interesting form of the Brown hoist is the type used by the Cramp Shipbuilding Company. As will be noted in the illustration, the cantilever is divided into two arms, one aiding to balance the loaded arm by means of a counterweight. It is operated by electric motors, which give it a speed of 200 feet a minute, hoisting a load of 14 tons. It can "trolley" the same weight at the rate of 500 to 800 feet a minute, and move along the tramways carrying 5 tons at the rate of 750 feet in a minute. It serves two sets of shipways at one time, and two men only are required for its operation. As a further indication of the performance of these cranes in shipbuilding, it may be stated that a cantilever at the yard of the Cramp Shipbuilding Company transferred the sternpost of the battleship "Retvizan," weighing 18 tons, from the railroad cars in the front part of the yard to its proper position in 20 minutes, including all the time required to secure it temporarily.

On the front page is shown a car-dumping machine, which is notable for its massiveness and power. Its principal features are a cradle, into which the car is clamped, which turns the car and discharges its contents into tubs or receptacles, and overhead traveling cranes, which transfer the tubs with their contents into the hold of the vessel to be loaded. When the cradle is in its lowest position, as shown in the picture, a loaded car of coal is pushed into the same by means of the car-pushing device, or "ground-hog," which is so named because it rests in a pit between the tracks, when not in use, to enable the cars to pass over it. Once in the cradle, the car is quickly clamped on the top and sides with hydraulic clamping-bars, and the engines set in motion, slowly turning the cradle over until the car is upside down. During the process of overturning the car, the coal has rolled from the car into six hopper-compartments attached to the cradle, and these six hoppers have each of them entered a transfer-tub, also shown in the picture. The hopper-compartments have doors which are automatically released on touching the bottom of the transfer-tubs. Therefore, when the cradle is returned to its original position, the car of coal is left in the transfer-tubs. It is necessary to put the coal in these oblong tubs, so that it can be lowered by cranes into the vessels. When the cradle has returned to its former position, the empty car is pushed out by the next loaded car coming in, and runs by gravity to the empty track; then the loaded car is clamped in place and the operation repeated. In the meantime, however, the tub-hauling car, containing the tubs just filled, is pulled away by the operator, and replaced by a car containing empty tubs.

Two overhead steam traveling cranes, running over the machine at a speed of 600 feet per minute, and provided with telescopic rams which work independently of the balance of the machine, take the tubs, one at a time, from the tub-handling car and lower them into the ship's hold, where, after touching the ship's bottom or the top of the coal pile, the doors are released, and the coal rolls out as the tub is returned to the car. The next tub is then dumped in the same manner. When all the tubs are emptied, the car is returned to the hoppers for another load. The crane operator can distribute the coal to all hatches. The vessel is on an even keel at all times. Two overhead cranes are ample to handle 5000 tons in 10 hours, and the tipping device is able to handle twice as much. Therefore, with the simple addition of two overhead cranes, one car dumper actually has a capacity of 10,000 tons in ten hours. The use of the bridge tramway and its modified forms is largely responsible for the rapid increase in size of the vessels on the Great Lakes. Fleets are now plying between Lake Superior ports and Cleveland, Conneaut, Buffalo and Chicago which carry from 6000 to 7500 tons of cargo each—as much as a large ocean-going tramp steamship. The largest of these vessels can be loaded or unloaded in less than 24 hours by means of the bridge tramways and fast plants, or the car dumpers, as the records show. Six thousand tons of ore have been taken from the steamship "Carnegie" at the Conneaut docks in 16 hours' working time, an average of 351 tons an hour. The steamship "Superior City," carrying 6700 tons, has been unloaded at South Chicago in 11¾ hours, an average of 569.2 tons an hour, while the "Manila," perhaps the largest cargo carrier on the Lakes, has been cleared in 12½ hours, an average of 592.4 tons an hour. The "Manila" and "Superior City" are provided with twelve and thirteen hatchways, respectively, and a bridge tramway was connected with each hatch. The cost of handling ore by this method varies from 1.32 cents per ton to 1.75 cents, depending upon the price paid for labor and fuel at various points. In tests made of coal-dumping machines at Toledo, Ohio, twenty-seven vessels were loaded with 57,100 tons of coal at a cost of 3.48 cents per ton including premium, allowance for repairs and supplies, and 114 hours' time for which the men were paid when the apparatus was not worked. Coal has been loaded by this method at a cost of 3.3 cents per ton, allowing for all expenses except interest upon the plant. The force required to handle one of the coal-dumping machines at this dock consists of four men for handling the buckets, two to operate the "ground-hog," one car puller, two signal men, and from twenty to thirty men for trimming the cargo according to the size of the boat.



CALIFORNIA BLUE-TAIL LIZARD.

SOME CALIFORNIA LIZARDS.

BY CHARLES F. HOLDER.

The stroller through Southern California cannot fail to notice the remarkable lack of noxious animals which are supposed to be a part of the equipment of tropical or semi-tropical countries. They may be summed up as rattlesnakes, tarantulas and scorpions, but are rarely seen, and as a rule have to be hunted for. Among the attractive animals are the lizards, which, owing to the peculiar changes of climate between day and night, pass through a winter sleep every twenty-four hours. Especially in the San Gabriel Valley every pile of stones or brush which affords a shelter has its lizard contingent, the one most in evidence being the brownish, bronzed alert little creature shown in the accompanying figure. It is generally found on the topmost stone, lying basking in the sun, a miniature Moloch. In color it ranges from a dark steel blue to brown, and has more or less power of assimilation. As you approach, it resembles the darkest stone, and possibly would not be noticed did it have the wit of some of its fellows; but perchance there is an element of vanity in this lizard as, at least in the experience of the writer, it apparently cannot resist the temptation of displaying its splendors and trying to dazzle the observer. This is accomplished by rapidly raising and lowering the body, which results in a blaze of bluish iridescent tints if the sun is shining, that at once attracts the attention and might disconcert a timid enemy. The lizard continues the movement, lifting itself rapidly on its fore-legs, displaying its charms, which are in the nature of a vivid iridescent patch just beneath the head and upon the breast, not visible when the animal is in its normal position, but brought sharply into view when the lizard stops, raises its head and moves rapidly up and down, as a man waves his hand to display the dazzling effulgence of a diamond or ruby. What the object of this movement is, may be conjectured. It may be to arrest a pursuer or frighten it; yet the chief enemies of the lizard are the garter and other snakes and the roadrunner—foes which would not be stopped by so whimsical a display.

One of the most interesting members of this tribe is the blue-tail lizard. The body is dark brown, long and attenuated, the slender tail a vivid turquois blue. So conspicuous is the latter that at some distance off it would attract the attention of the most indifferent animal or person, and is apparently a dangerous appendage, drawing notice to the defenseless bearer. But the lizard has other qualifications which offset this brilliant lure; it is one of the most agile of all the tribe, its movements being inconceivably rapid, so much so that in many months the writer secured but one specimen, though many were seen, and then the tail would often be tossed off, remaining a wriggling lure while the animal itself escaped.

The cañons of the Sierra Madre are interesting localities in which to observe the lizards. Among the ferns and dry leaves they are constantly scampering about; now clinging to some branch or bough in pursuit of insect prey, or lying prone upon a moss-covered bowlder in the hot sun, simulating it in color and tint to so remarkable a degree that it is almost invisible until touched. Other lizards, sluggish forms, are found in damp places, also imitating the color of the leaves. All these lizards have their enemies. The garter snakes capture many of them, rattlesnakes being equally dreaded. The butcher birds are always on the lookout for them, and the dried skins and skeletons of lizards are seen hanging to limbs of trees or impaled upon the spines of orange trees.

But the most insatiate enemy of the California lizard is the bird known as the chaparral cock, or road runner. Its fierce eye never fails to penetrate the cunning disguise of the lizards, and the latter are picked up and devoured by this bird in astonishing numbers. The writer has taken ten lizards from the crop of a single bird—not so suggestive of its appetite as its discerning powers. The road runner is remarkably fleet of foot. It is difficult to run it down with a fleet horse, as curiously enough they will run a long distance when pursued before taking to the wing, doing this only as a last resource. Their agility on foot explains why they capture so many lizards.

On the edge of the great mesa that reaches down from the base of the Sierra Madres, the earth is perforated in every direction with the holes and tunnels of the lizards which undergo this strange winter sleep every twenty-four hours. At night in winter they become rigid and stiff, and enter a state of hibernation or coma. In throwing over piles of stones early in the morning many would be found in this condition, unable to move, apparently unconscious, but after a few moments' exposure to the sun they become active. In the Northern States, in the winter sleep the lizards descend into the earth and lie dormant until summer, but in California the winter sleep is undergone every winter night.

Circumference of double trunk, 8 feet 5⅓ inches. Area covered by vine, 115 feet square.

BIG GRAPEVINE AT SANTA BARBARA.

SANTA BARBARA'S BIG GRAPEVINE.

BY M. C. FREDERICK.

Wherever the fame of Santa Barbara has spread, that of her big grapevine has likewise expanded. The vines are of the Mission variety, brought from Spain by the Mission Fathers.

There was many a pang of regret when, in the Cen-

tennial year, it was known that the old landmark in the Montecito Valley was to be cut down and a portion of it removed to the exposition at Philadelphia; but it was whispered that relentless Age, who is no respecter of grapevines, was beginning to impair its vitality, and that the inevitable was only hastened a little by the intervention of man.

No record was kept of the time of planting, but from events connected with the family upon whose ground it grew, it was believed to be seventy-five or a hundred years old. The measurement of its trunk is given as three feet ten inches in circumference, and the arbor about seventy-five feet square. Its death was believed to be premature, the result of changing the course of a small stream that had flowed near its roots.

But another vine nearby, a cutting from the original, had attained to nearly this size, so Santa Barbara could still boast of having "the biggest grapevine in the world." In '99 this vine succumbed to a disease of the roots, perhaps invited by age, and its body now rests in the Santa Barbara Chamber of Commerce. Its irregular trunk attained a girth of four feet four inches at eighteen inches above ground, or five feet seven inches at forty-two inches, and its maximum yield was four tons in a season. It was believed to be seventy-five years old.

In the Carpinteria Valley, a few miles further from the city, a third vine has surpassed both of the others in size. It was planted in 1842 by Joaquina Lugo de Ayala, and has therefore just completed its three-score years. The first election in Santa Barbara County under American rule was held beneath its ample shade. This latest candidate for the world record is double from the surface of the ground up; the two parts are knit together in a David-and-Jonathan-like embrace to a height of about five feet seven inches, where they separate into huge branches, the largest having a circumference of three feet. Six inches above the ground the vine measures eight feet five and a half inches in circumference, and it covers an area one hundred and fifteen feet square (the whole back yard), sixty posts supporting the framework. The owner says that, were provision made, it would spread over a greater surface, but it is pruned every year. Fabulous tales are told of the grapes this vine produces. That it did actually yield ten tons in a recent season seems to be authentic.

An effort was made to secure a part of the original Montecito vine—taken to Ohio after the Centennial—for the Santa Barbara exhibit at the World's Fair, but terms could not be made with the owner. At the time of the succeeding Mid-Winter Fair at San Francisco, an offer of a thousand dollars for the Carpinteria vine was refused, else its lease of life would have been cut short.

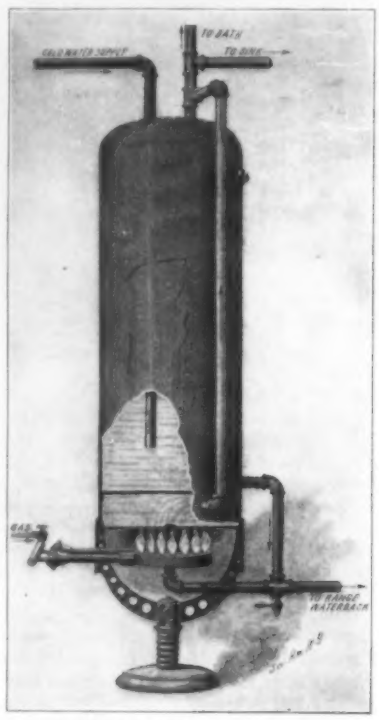
DEVICE FOR SECURING DOOR-KNOBS.

By means of the invention described below, idle movement of the door-knob is avoided and the knob is prevented from becoming loose on the spindle or from being detached therefrom. The natural operation of the parts continually tends to tighten the knobs on the spindle, and just sufficient movement is allowed to operate the latch. Our illustration shows an ordinary door lock provided with this improved device. The spindle which operates the latch is threaded oppositely at each end to engage the door-knobs. The knobs are rigid and integral with the shanks and roses or escutcheons. Fastened to each side of the door and surrounding the spindle is a bearing-annulus. Against these annuli the roses or escutcheons bear so as to turn thereon, and this turning movement is limited by pins or screws carried rigidly on the door and projecting through the annuli into arc-shaped slots formed in the roses of the knobs. The slots are of such length that they will allow the knobs the movement necessary for throwing the bolt of a lock. In assembling the parts the knobs are screwed up on the ends of the spindle until the roses or escutcheons bear snugly against the annuli, and the pins are projected respectively through the slots and through the holes in the annuli, thus holding the latter in position. It is evident that this arrangement securely holds the knobs, prevents idle movement, and permits just sufficient movement for operating the latch. Patents for this invention have recently been granted to Mr. Thomas G. Leslie, of East Melbourne, Victoria, Australia.

DEVICE FOR SECURING DOOR-KNOBS.

A SUMMER WEATHER WATER BOILER.

Probably every housewife who has perspired through a hot summer's day in the small kitchen of a small city apartment, will appreciate at its true worth the simple arrangement shown in the accompanying engraving. Rather than keep up a hot fire during the summer months, many housekeepers do their cooking on small oil stoves and gas ranges. The convenience of this arrangement is, however, offset by a serious objection, namely, the lack of a ready supply of hot water; for the water has to be heated in kettles or pails on the limited surface of the gas range. J. P. B. Sadtler & Co., of 231 Park Avenue, Baltimore, Md., are the makers of a boiler and heater particularly adapted for hot weather service.



A SUMMER WEATHER WATER BOILER.

As illustrated, the boiler is supported on a suitable standard and is heated by a small gas heater. The heater is provided with adjustable valves for the admission of air and consists of a perforated chamber through which the mixed air and gas flow so as to produce a hot blue flame. This provides a very intense heat of limited distribution, so that its energy is confined to the boiler and does not appreciably affect the general temperature of the room. The heater is absolutely odorless and, being situated under the boiler, takes up no room. There are no coils nor complicated mechanism to get out of order and its simplicity should appeal to all. But aside from this an important feature of the apparatus may be found in the construction of the boiler. It will be seen that the boiler is divided into two sections by a false bottom. The lower section being very shallow will be rapidly heated by the burner. Water from the upper section passes out through a pipe near the false bottom, and passing through the center of the burner enters the lower section from below. In this section the water is thoroughly heated and passes through a pipe into the upper section at the top, thus keeping a constant circulation. Bath room and sink connections are made directly to the latter pipe, so that a dozen gallons of hot water can be had in 15 minutes or the entire contents of the 32-gallon boiler may be heated in 45 minutes. The internal arrangement of the boiler prevents the accumulation of mud which so often causes slow heating of the water, and the heater stirs up the water to such an extent as to loosen the sediment, when it may be drawn off through a stop-cock shown at the right of the boiler. It will be seen that connection may be made to the water-back of a range whenever desired and equally as good results obtained; though it is claimed that the gas burner will do its work at a much smaller expense. Where a great quantity of hot water is wanted the water-back of the range and the gas burner can be used at the same time and a continuous flow of hot water can be had.

HARVESTER REEL.

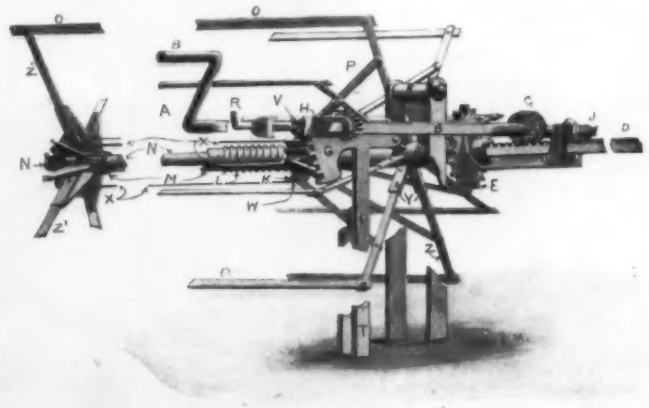
The harvester reel which is illustrated herewith possesses many advantages over those in common use. The reel is so constructed as to permit any desired variation in its diameter, the parts being held firmly in any position to which it may be adjusted. The reel may, therefore, be quickly reduced in diameter to avoid obstacles, and thus prevent breakage. It may also be quickly folded into small space for housing or to permit easy access to the sickle bar and other parts of the machine which often need attention. Being foldable, the reel may be easily moved from one field to another.

The illustration shows the mechanism partly broken away for the purpose of bringing out details. The reel-shaft, *M*, which is hollow, is provided with a driving sprocket, *E*, and is journaled in the bearing link, *F*, which swings from a rod supported by the standards, *SS*. Fixed to the hollow shaft, *M*, are the reel-hubs, having pairs of radial flanges, *Y*, in which the arms, *Z* and *Z'*, are pivoted. At their outer ends, these arms are connected by cross bars or beaters, *O*. A sleeve, *K*, is loosely mounted on the reel-shaft, and to this are pivoted the links, *P*, which connect with the arms, *Z*. By pulling the sleeve toward the outer hub, it is evident that the arms, *Z* and *Z'*, will be drawn from the vertical, thus reducing the diameter of the reel. When the sleeve is released, the spring, *L*, which is coiled between the outer hub and the sleeve, operates to return the latter to its initial position.

The mechanism for operating the sliding sleeve consists of a rod, *N*, which extends through the hollow shaft. Just beyond the outer hub this rod is reduced in diameter, and carries a disk loosely mounted thereon and abutting against the shoulder thus formed. A number of rods, *X*, connect this disk with the radial arms, *W*, of the sleeve, *K*. The opposite end of the rod, *N*, is formed into a rack, *D*, and is supported in a frame loosely mounted on the shaft, *M*. A crank-shaft, *B*, finds bearing in this frame and is provided with a barrel pinion, *C*, slidably mounted thereon. A slotted link on the end of the frame serves to hold the rack in engagement with this pinion. The near wall of the pinion forms a clutch member which normally engages a pin on the shaft, *B*. A coil spring on this shaft abuts at one end against a washer, *J*, and at the other against the frame, tending to hold the clutch members in engagement. The near end of the shaft is made vertically adjustable, and is held against rotation by a mechanism now to be described.

A standard, *T*, is secured to the harvester frame and carries a locking rack, *G*. A bracket, *H*, which is secured to this standard, carries a dog, *R*, which, under tension of spring, *V*, is held in engagement with the locking rack, *G*. The bracket also holds, between the arms of a yoke, a ratchet wheel slidably mounted on the shaft, *B*, and engaged by a spring pawl. This sliding connection permits the reel shaft to be swung on the link, *F*, to any desired position.

It will be seen that when the shaft, *B*, is rotated, the pinion, *C*, is caused to rotate, and thereby the rack, *D*, and rod, *N*, are moved outward through the hollow shaft, *M*, causing the reel to fold. The reel is held in any position of adjustment by the ratchet wheel on the shaft, *B*. When it is desired to expand the reel, the shaft, *B*, is moved backward longitudinally, thereby releasing the clutch and allowing the pinion, *C*, to rotate freely, whereupon the spring, *L*, causes the reel to expand as previously described. A



CONSTRUCTION OF THE HARVESTER REEL.

patent for this improved harvester reel has been granted to Mr. Ben ami Selph, of Hillsboro, Ohio.

IMPROVED VENEER BASKET.

A patent has recently been granted to Mr. Edgar Aber, of Jacksonville, Tex., for an improved veneer-basket. The basket belongs to that class which is now extensively employed in the packaging and shipping of fruit, and the invention lies in an improved construction whereby the article is made much lighter and stronger and does not require as much veneer stuff in its manufacture. Provision is also made for the secure attachment of the handle without the

IMPROVED VENEER BASKET.

necessity of nailing or stapling the same in place, thus allowing the handles to be placed in the bottom of the baskets when it is desired to nest the baskets and stack them for shipment or transportation. This is shown in Fig. 3 of our illustrations. The body of the basket is formed of two sections each bent from a single section of veneer so as to produce the bottom and two sides. The bottom is further strengthened by a long piece of veneer extending the full length of the basket and bent up at each end. These end portions are slitted as indicated in Fig. 2 to form an upstanding spiint and two tongues. End portions of the basket are secured by these slitted ends, being held between the splints on the outside and the tongues on the inside. The end portions, as shown, are curved to close the corners of the basket. The usual reinforcement bands around the top hold all parts securely. The handle portion, which is bent to the shape shown in Fig. 4, is provided with a groove on each leg. The width of these grooves is equal to that of the outer band on the edge of the basket, so that when it is desired to fix the handle in place, the legs which are sharpened at the ends, are forced in between this band and the body of the basket until the band snaps into the grooves on the handle as shown in Fig. 1. A cover is also shown in this view which may be employed when desired. This cover rests upon the top edge of the basket and is secured by metallic fasteners designed expressly for this purpose. From the foregoing description it will be readily seen that Mr. Aber has invented a basket of very strong construction which may be cheaply and easily made and which can be very conveniently stacked for shipment.

A SIMPLE AND EFFICIENT WIRELESS TELEGRAPH RECEIVER.

BY A. FREDERICK COLLINS.

It is not often true that the cheapest appliance is the best, or the simplest apparatus the most efficient, yet there never was anything to which this seeming paradox could be applied more literally than the receiver about to be described for wireless telegraphy.

There are at present two distinct types of receivers employed in translating electric waves impinging on the coherer into readable Morse. The first is by means of a relay wound to high resistance and placed in series with a dry cell, and having in the auxiliary circuit a tapper for decohering the filings and a Morse sounder or ink-writing register. The second type is the acme of simplicity, cheapness and sensitiveness, and inasmuch as Marconi used this form in receiving the letter S in his first Transatlantic cableless signals, it may prove interesting to those who are following the advance of the art, as well as to those experimentally engaged in it, to detail its construction. In a word, this receiver consists of three parts only, namely, a coherer, an ordinary telephone receiver and a dry cell; while supplementary to these are the vertical wire or antenna and the earthed connection.

In the SCIENTIFIC AMERICAN of September 14, 1901, the writer described an experimental coherer, one that is eminently adapted for this new type of receiver, but even the turned brass work of this coherer may be dispensed with and one substituted for it that may be constructed for a few cents.

The requirements are two binding posts, probably largest size, of the class known as double wood screw posts; these have two openings in each post, and are fitted with two set screws. A hardwood base, 3 inches wide, 4 inches long and ½ inch or ¾ inch thick should be provided, and the posts screwed into the surface at a distance of 1 inch from the ends. Two pieces of straight brass wire 2 inches in length and of such diameter that they will slide easily, yet not too loosely, through the apertures of the binding posts, are now provided. A piece of glass tubing 1 inch in length and having a bore of exactly the same diameter as the wires or coherer plugs, as they are termed, completes the coherer, with the exception of the powder or metal filings. Instead of silver or nickel filings, usually employed in coherers, carbon granules such as are found in telephone transmitters are used, or if these are not to be obtained easily a piece of arc light carbon may be powdered and this inserted in the tube. The amount required may be roughly estimated at 1-16 inch in length when compressed between the coherer plugs.

A carbon coherer has a great advantage over a metal filing coherer, in that it is self-restoring, that is to say, no tapping is required to decohere the particles, but it assumes its normal high resistance the instant the incoming electric wave ceases to impinge upon it. Another point in favor of the carbon coherer is that the tube does not require exhaustion, since carbon does not oxidize in air like metals. Iron filings are also self-restoring to a certain degree and may be used if desired.

To increase the sensitiveness of the coherer the ends of the brass plugs that are inserted into the glass tubing may be immersed for a moment in sulphuric acid and then dipped in mercury, the ends thus being amalgamated, after which the ends should be wiped with a dry cloth. The thin film of mercury will prevent the oxidization of the ends of the plugs.

After the carbon is placed in the tube insert the plugs. Fig. 1 shows the coherer complete. A telephone receiver of any description may now be pressed into service. A very excellent type of a telephone receiver known as the "standard" may be had for a dollar or less, but in lieu of this a pony telephone receiver may be employed with good results; however, the higher the resistance of the receiver coils the greater the sensitiveness of the receiving apparatus as a whole.

Our next step is to connect the coherer and receiver with a dry cell. In the lower opening of each binding post insert a piece of insulated wire—flexible wire is the best. Then connect the free end of one wire to a binding post of the telephone receiver; to the negative element of the dry cell connect the terminal of the other wire leading to the second binding

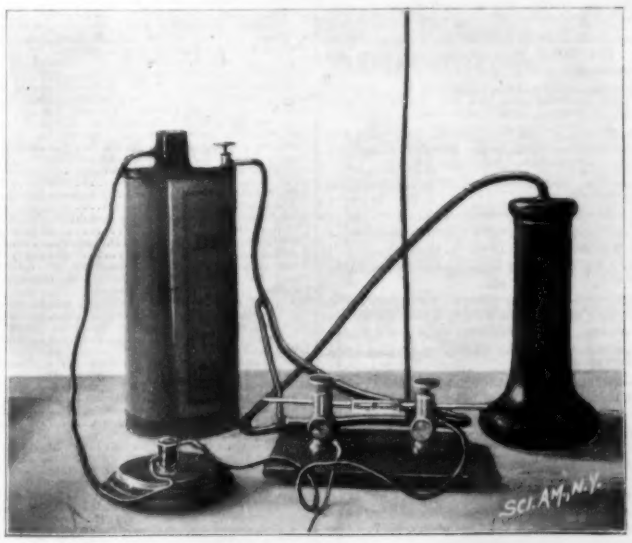


Fig. 1.—CHEAP WIRELESS TELEGRAPH RECEIVER.

post. The carbon of the cell is now connected with the other binding post of the telephone, or in other words, the coherer, dry cell and telephone receiver are connected in series as shown in the diagram, Fig. 2. A switch may be inserted in the circuit as shown, this saving time and trouble in throwing the current on or off. The antenna or vertical wire may be of No. 14 or 16 insulated, or bare wire or annunciator wire will answer the purpose admirably. This should be at least 30 feet in length and suspended outside the building from insulators either of glass or porcelain, and just as nearly vertical as possible until the level of the instrument is reached, when the wire may be bent at right angles and lead to the coherer. A wire of the same size leads to the ground and is soldered to a copper or zinc plate 12 inches x 12 inches, buried in the earth to a depth of a foot or two. A copper plate of the same size may be attached at the upper end of the vertical wire, exposing a greater surface for the reception of the waves.

This is the complete wireless telegraph receiver and only requires adjusting to be ready for immediate use. To obtain the maximum sensitiveness of the coherer withdraw one of the plugs from the granules until it barely touches them; now close the switch and place the telephone receiver to the ear, gradually slide the plug into contact with the carbon, giving it a turning motion to secure a finer adjustment. At first there

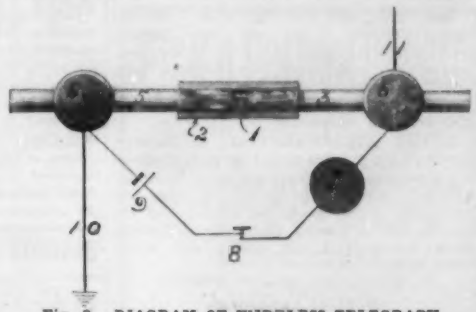


Fig. 2.—DIAGRAM OF WIRELESS TELEGRAPH RECEIVER.

will be no sound in the telephone receiver, but when the resistance of the granules is sufficiently reduced the current will commence to flow through the circuit and the varying degrees of contact caused by the current changes the resistance constantly and the telephone receiver responds accordingly. If the conductor plugs are forced in too tightly the carbon particles will become packed and the resistance lowered to such an extent that the current flows through the circuit without producing any audible effect; thus a value must be found between the maximum resistance when the conductor plugs are separated and the minimum resistance when they are forced tightly together. When the proper value has been ascertained the diaphragm of the telephone receiver will vibrate with a correspondingly great amplitude and the sounds will be the loudest; when this degree is obtained screw the conductor plug down firmly and open the switch.

To receive a message, simply place the receiver to the ear and close the circuit. When the waves are emitted from the distant station broken up into dots and dashes the telephone receiver will reproduce them by a series of rapid vibrations that are characteristic and easily differentiated by the listener.

There is another use to which this wireless receiver may be put, and this is the study of atmospheric electricity on the difference of potential between the strata of charged air through which the antenna passes and the earth immediately under it. For instance, if the air is charged positively the earth will be represented by a negative charge, and this difference will in equalizing in the coherer produce marked audible effects in the telephone receiver; to the trained observer storms may be determined with considerable accuracy, though they may be raging many miles away at the time.

In all of the portable wireless telegraph systems now in use in the different armies this form of receiver has been adopted, because of its compactness, lightness, sensitiveness, speed, permanency and ease of adjustment.

It has for practical wireless telegraph purposes one objectionable feature, and that is its aptitude for registering atmospheric disturbances and thus often confusing the operator who is interpreting the Morse code, by false jamming. Operators, however, become so thoroughly proficient in deciphering the messages that they are usually able to eliminate the false from the true wave impulse.

From Chicago comes the news that woman has conquered still another field, over which man formerly reigned supreme. She is now employed in the stockyards in Chicago, the last place in the world that one would expect to find her. To be sure, she does not actually slaughter the animals, but even that may come in time. In the packing and canning factories some thousands of women have taken the places of men; if the business grows, as it has done in the last three years, thousands more will find positions. The work is light, is technically called "kitchen work," and consists in the cutting of dried beef, packing of cans, stuffing of sausages, etc.

RECENTLY PATENTED INVENTIONS.

Machines and Mechanical Devices.

SWINGING MACHINE.—F. J. McDONNELL, New Bedford, Mass. The swinging machine is so constructed as to automatically cause the swinging motion of the carriage during the downward movement thereof, thus particularly adapting the device for use in the care of babies or children, or for older persons when a hammock or the like is used as a carriage.

DOUGH-MOLDING MACHINE.—C. A. THOMSON, Belleville, N. J. This dough-molding machine is more especially designed for forming a lump of dough into a sheet, which is subsequently rolled up into a spiral roll and subjected to a rolling and squeezing pressure to knead or work the dough into proper condition for the pan in which the dough is to be baked into bread of very high quality.

SHUTTLE MECHANISM FOR SEWING MACHINES.—C. T. WARREN, San Antonio, Texas. The shuttle is held clear of the raceway to prevent undue friction and wear therefrom. Provision is also made to arrange the tension on the inner side of the shuttle or side next the raceway.

LATHE ATTACHMENT.—J. D. HEWITT, Brooklyn, N. Y. The object of this invention is to provide a new and improved lathe attachment arranged to permit of using the lathe for sawing wood, soft metal, and the like in such a manner that tongues, grooves, slots, miters, etc., are readily and accurately formed.

Medical Apparatus.

VAGINAL SYRINGE.—C. F. ALLEN, Hueneme, Cal. This syringe may be easily taken apart for cleansing, and is modeled in accordance with the anatomical curve of the vagina. The construction is such as to completely seal the entrance into the vagina, so that the liquid will accumulate in the vaginal cavity and expand it to its fullest capacity. The material may thus be held in contact with diseased portions for any desired length of time and afterward expelled through an especially designed outlet.

Tools and Instruments.

CLIPPER.—R. F. WERK, New Orleans, La. This clipper is designed for cutting the outstanding fibers, hairs, or filaments from cordage of any sort. The tool comprises two knives or sets of knives which are relatively movable in concentric circles, the cord being passed through the center of these circles.

LEVELING INSTRUMENT.—G. H. PRIER, New York, N. Y. This level-finding instrument is of such simple construction that any person, skilled or unskilled, may readily understand and operate the instrument to find level lines in any direction. The device is particularly adapted for the use of builders, contractors, plumbers, and, in fact, all occupations where level lines are to be formed.

Valves.

ROTARY VALVE.—J. B. STAGE, Talbot, Mich. This rotary valve is arranged to reduce the steam pressure on the valve-plug to a minimum and to permit easy turning of the plug. The valve is designed for use in the steam-feed for sawmills, and is constructed to automatically shift the valve-plug and cut off the steam in case of a break in the connection from the valve to the sawyer to bring the sawmill carriage to a stop.

CONTROLLING DEVICE.—T. P. FORD, Hackensack, N. J. This invention relates to dampers and other mechanisms controlled by fluid under pressure. The controlling device is very effective and exceedingly sensitive in operation, thus insuring proper working of the mechanism with which the controlling device is connected.

AUTOMATIC VENT-VALVE.—L. J. WALSH, New York, N. Y. This invention provides a vent-valve for tanks and other receptacles to be filled with liquid, which valve will permit air in the tank to pass out while the liquid is flowing in until the receptacle is filled, when the air-valve will be automatically closed, causing the liquid to back into the supply pipe, and thereby indicating at the source of the liquid supply that the tank has been filled and that the supply should be shut off.

Miscellaneous Inventions.

SELF-CLOSING GATE.—E. H. CARPENTER, Florence, Colo. A cord provided with a weight is secured to the gate and passes through pulley blocks on the gate-post. The pulleys are arranged to conduct the cord around the corner of the post without causing undue wear of the cord or distortion of the gate.

SHOW-CASE.—A. REINLE, Baltimore, Md., Mr. Reinle provides, between the adjoining plates of a show-case, a joint strip which is resilient transversely and forms a cushion spring between the adjoining plates. The joint strip is provided with a wing which overlaps the outer face of the plate, so it can slide along the face in the cushioning operations of the joint strip.

PAINT.—T. L. LEE, Memphis, Tenn. Mr. Lee has invented a cheap and durable paint which consists of three parts, by bulk, distilled coal-tar, one part dead-oil, one part refined benzol, one hundred per cent, one part Chickasaw ocher. If a thicker composition is desired a larger proportion of coal-tar may be used.

FIREARM.—W. F. COLE, Waco, Texas. The invention consists in providing breech-loading guns with guards adjacent to the gate for insuring insertion of a cartridge in the latter—that is to say, the presentation of ball-cartridge to the breech in such due position as to avoid jamming the projectile in the bore.

COFFEE-FILTER.—A. F. SHRIVER, Arbuckle, Cal. This device provides a means for holding and filtering coffee while boiling or steeping. The filter may be readily inserted or removed from the coffee pot by means of which the grounds may be lifted out of the liquid, thus avoiding the impairing of the flavor.

LINOTYPE-GALLEY.—F. E. MILHOLLAND, Brooklyn, N. Y. This improved galley will conveniently hold any amount of linotype matter up to its full capacity without the aid of quoins, side sticks or blocks, and is so constructed that whenever desired the linotype bars may be readily removed in whole or in part from the galley.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

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Inquiry No. 2828.—For dealers in patent gasoline self-heating smoothing irons.

We design and build special and automatic machinery for all purposes. The Amstutz-Osborn Company, Cleveland, Ohio.

Inquiry No. 2829.—For a motor spring for running a sewing machine.

Machine Work of every description. Jobbing and repairing. The Garvin Machine Co., 149 Varick, cor. Spring Sts., N. Y.

Inquiry No. 2830.—For dealers in regularly cut figures, such as soldiers, indians, etc., 1½ inches high, on a small, thin base, so as to stand erect.

Manufacturers of patent articles, dies, stamping tools, light machinery. Quadriga Manufacturing Company, 18 South Canal Street, Chicago.

Inquiry No. 2831.—For dealers in machines for making photo buttons.

Patents developed and manufactured, dies, special tools, metal stamping and screw machine work. Metal Novelty Works Co., 43-47 S. Canal St., Chicago.

Inquiry No. 2832.—For the address of the Ludowici Tile Co.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Refrigerating Machine Company. Foot of East 138th Street, New York.

Inquiry No. 2833.—For parties to make a 6 h. p. compressed air engine.

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Inquiry No. 2840.—For makers of small draw fans

Inquiry No. 2841.—For makers of turbine engines of very small pattern.

Inquiry No. 2842.—For machinery for manufacturing flour from bananas.

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Spoons, forks, etc., handle for, S. A. Keller 35,965
Trimming, G. H. Taylor 35,968
Type, font of border, H. Barth 35,966, 35,967

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Aluminium and aluminium alloys, Pittsburg Reduction Co. 38,523
An antimalarial, H. S. Clark 38,512
Cigarette paper and cigarette tubes, C. Schutz 38,509
Cigars, smoking and chewing tobacco, and snuff, Upmann & Wilcox 38,520
Corsets, C. Guillot 38,501
Corsets, Royal Worcester Corset Co. 38,502, 38,503
Dairy goods, certain named, Star Milk Cooler Company 38,516
Dress shields, Canfield Rubber Co. 38,499, 38,500
Drillings and sheetings, G. L. Montgomery 38,506
Fabrics, cotton, Ward, Hanbury & Co. 38,508
Food compound, certain named health, Darmstadt German Food Co. 38,517
Food, stock, Central Stock Food Co. 38,515
Fungicides and insecticides, Bowker Insecticide Company 38,513
Gelatin, Kingery Manufacturing Company .. 38,519
Gelatin preparation for table desserts, Grocers Specialty Mfg. Co. 38,518
Harness and hoppleş, Frank S. Dure Co. 38,524
Oil, machine, C. Shenkberg Co. 38,521
Oils, certain named lubricating, C. Shenkberg Co. 38,522
Pens, Esterbrook Steel Pen Manufacturing Co 38,497
Salve, National Drug & Pharmacal Co. 38,514
Sheetings, Belton Mills 38,504, 38,505
Shirtings, sheetings, and drills, E. L. Sutfern 38,507
Soap, toilet, Lambert Pharmacal Co. 38,511
Tubes, vials, boxes, vaccination shields, and wrapping sheets, collapsible, Transparent Cellulose Products Company 38,510

LABELS.

"Ferr Malt Wine," for medicine, L. Porges 9,246
"Morton's Sweet Smokers," for cigars, Schmidt & Co. 9,244
"Standard Sanitary Manufacturing Co., Pittsburg, Pa., U. S. A.," for sanitary ware, Standard Sanitary Mfg. Co. 9,247
"Srenckt Malort Branvin," for medicine, B. Lindqvist & Co. 9,245
"The Little Giant," for fire extinguishers, Little Giant Fire Extinguisher Co. 9,248

PRINTS.

"Domino Dot," for a game, G. H. Bailey 525
"Malt Too," for cereal food, Malt Too Flake Food Co. 526

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 10 cents, provided the name and number of the patent desired and the date be given. Address Munn & Co., 361 Broadway, New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list. For terms and further particulars address Munn & Co., 361 Broadway, New York.

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.
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Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled

(8628) K. H. M. writes: I wish to use a small hand-feed arc lamp using ⅛-inch carbons, on a 104-volt alternating current circuit. Will you kindly tell me how much and what size iron wire I should use as a resistance coil for this lamp? Should the wire be bare or covered? A. A rheostat can be made for a hand-feed arc lamp to consume 10 amperes with about 500 feet of No. 12 German silver wire. Bare wire is to be used, as the heat would burn the insulation and make a bad odor. Twice the quantity of iron wire of the same size may be used. The rheostat should be made so as to be varied and adjusted to the condition of carbons and current.